Thirty-Fifth

Annual Report

of the

Board of Water and Power Commissioners

of the

City of Los Angeles

Fiscal Year Ending June 30, 1936

THIRTY-FIFTH ANNUAL REPORT

BOARD OF WATER AND POWER
COMMISSIONERS OF THE CITY
OF LOS ANGELES, CALIFORNIA

FISCAL YEAR ENDING JUNE 30, 1936.

COMMISSIONERS: JOHN R. HAYNES, President
WATT L. MORELAND • ALFRED LUSHING • ARTHUR J. MULLEN
F. D. HOWELL

Secretary of Board, JAS. P. VROMAN
Controller, L. M. ANDERSON

Chief Engineer and
General Manager • Bureau
of Water Works and Supply
H. A. VAN NORMAN

Chief Electrical Engineer
and General Manager •
Bureau of Power and Light
E. F. SCATTERGOOD

DEPARTMENT OF WATER AND POWER

Roll of Commissioners

AND THEIR TENURE OF OFFICE

Herman Silver, President	February, 1902,	to	February,	1903
Chas. H. Toll	February, 1902,	to	February,	1903
J. C. Drake	February, 1902,	to	February,	1903
F. W. King	February, 1902,	to	February,	1903
H. T. Lee	February, 1902,	to	February,	1903
L. A. Grant	February, 1902,	to	December,	1904
J. M. Elliott	February, 1902,	to	July,	1907
Jno. J. Fay, Jr., President	February, 1903,	to	February,	1910
Wm. Mead	February, 1903,	to	July,	1907
M. H. Sherman	February, 1903,	to	January,	1910
Fred L. Baker	January, 1905,	to	March,	1908
John R. Mathews	July, 1907,	to	March,	1911
John H. Norton	July, 1907,	to	March,	1911
R. F. del Valle, President	March, 1908,	to	July,	1929
Wm. D. Stephens, President	February, 1910,	to	March,	1911
H. T. Lee, President	February, 1910,	to	April,	1912
P. M. Johnson	March, 1911,	to	May,	1912
A. N. Davidson	March, 1911,	to	June,	1912
James C. Kays	March, 1911,	to	April,	1912
S. C. Graham	April, 1912,	to	June,	1913
Chas. Wellborn	April, 1912,	to	December,	1912
F. G. Henderson, President	May, 1912,	to	July,	1913
R. D. Wade	June, 1912,	to	August,	1913
Jno. W. Kemp	March, 1913,	to	December,	1917
Boyle Workman	July, 1913,	to	January,	1917
M. P. Snyder	July, 1913,	to	May,	1917
Byron Erkenbrecher	August, 1913,	to	January,	1919
L. H. Valentine	January, 1917,	to	August,	1917
C. H. Eubank	August, 1917,	to	July,	1918
John F. Andrews	October, 1917,	to	February,	1919
Howard Robertson, President	December, 1917,	to	January,	1922
E. R. Young	July, 1918,	to	January,	1923
Lester L. Robinson	January, 1919,	to	January,	1923
Frank Simpson	February, 1919,	to	January,	1921
John R. Haynes, President	January, 1921,			
A. G. Bartlett	January, 1922,	to	February,	1923
Jas. B. Baker	January, 1923,	to	August,	1927
C. A. Dykstra	January, 1923,	to	April,	1926
Jno. A. Burton	February, 1923,	to	July,	1924
Wm. P. Whitsett	July, 1924,	to	March,	1930
J. R. Richards, President	July, 1926,	to	November,	1929
Will E. Keller	August, 1927,	to	July,	1929
Harlan G. Palmer, President	July, 1929,	to	May,	1930
E. M. Scofield	October, 1929,	to	October,	1930
Frank H. Brooks	December, 1929,	to	July,	1933
A. B. Prior	March, 1930,	to	September,	1931
O. T. Johnson, Jr.	June, 1930,	to	July,	1931
Arthur Strasburger, President	October, 1930,	to	July,	1933
A. F. Southwick	September, 1931,	to	July,	1936
John W. Baumgartner, President	March, 1932,	to	July,	1933
John A. Eby	July, 1933,	to	October,	1933
Arthur J. Mullen	July, 1933,			
A. B. Prior	July, 1933,	to	March,	1935
Alfred Lushing	October, 1933,			
W. H. Hay	March, 1935,	to	April,	1936
Watt L. Moreland	May, 1936,			
F. D. Howell	July, 1936,			

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Letter to the City Council

August 1, 1936.

TO THE HONORABLE,
THE COUNCIL OF THE
CITY OF LOS ANGELES,
CITY HALL,
LOS ANGELES, CALIFORNIA.

Gentlemen:

Transmitted herewith is the Thirty-fifth Annual Report of the Board of Water and Power Commissioners, for the fiscal year ending June 30, 1936, compiled in accordance with the provision of Article IV, Section 64 of the City Charter, and covering activities of the Bureau of Power and Light, the Bureau of Water Works and Supply and the several Joint Divisions of the Department of Water and Power.

The Board wishes to take this opportunity to express its sincere appreciation of the numerous evidences of cooperation by the Council, Officers and other Departments of the City Government and to gratefully acknowledge the effective services of the Management and personnel of this Department in the interest of community welfare.

Respectfully submitted,

BOARD OF WATER AND POWER COMMISSIONERS
OF THE CITY OF LOS ANGELES,

JOHN R. HAYNES,
President.

Bureau of
Water Works and Supply

H. A. VAN NORMAN
Chief Engineer and General Manager

THE HONORABLE BOARD
OF WATER AND POWER COMMISSIONERS,
BUILDING.

July 1, 1936.

Gentlemen:

In presenting the Thirty-fifth Annual Report of the Bureau of Water Works and Supply, the various phases of the subjects are so well covered by my assistants in their detail reports, attached hereto, as to afford a very complete and comprehensive study of the work of the Bureau for the past fiscal year. However, I might bring out a few points in connection with our major construction activities in the Mono Basin and Long Valley.

The progress on the Mono Craters Tunnel during the year was 21,840.5 feet, as follows:

Heading No. 1 (West Portal)	8,502	feet
Heading No. 4 (west from Shaft No. 2)	4,616	feet
Heading No. 5 (east from Shaft No. 2)	2,669.5	feet
Heading No. 6 (East Portal)	6,053	feet

The total tunnel driven from the beginning of the project to and including June 30, 1936, is 30,689.7 feet, which represents 51% of the total footage to be excavated. Good progress was made, considering the difficulties encountered which consisted of large quantities of water and carbon dioxide gas. The gas was first encountered in small quantities approximately 7,900 feet from the portal. A second gas area was met at about 11,000 feet, near Test Hole 3 J, and a third at about 12,500 feet from the portal. The presence of this gas necessitated the sinking of Shaft No. 3, which was located at Test Hole 3 J. This shaft, to be used for the ventilation of the tunnel and as an exit for water encountered beyond, is 5 feet by 10 feet in size, and 535.5 feet in depth to tunnel grade. Sinking operations on the same were begun May 16 and completed June 30, the work being carried on from both the top and bottom of the shaft. The amount of water encountered in the tunnel has varied from 2,500 gallons per minute to a maximum flow of 5,521 gallons per minute.

Heading No. 4 was begun in October, 1935, west from the bottom of Shaft No. 2. Considerable water and heavy ground have been met throughout the drilling of this heading and have retarded the work to a considerable extent. In sections of very heavy ground it was found advisable to modify the shape of the concrete lined portion from the horseshoe section to one practically circular. The same forms that were purchased for the horseshoe section were changed slightly, and this has been accomplished. Heading No. 5 was started in October, 1935, east from the bottom of Shaft No. 2. On February 17, 1936, a pocket of water of approximately 4,000,000 gallons was encountered about 1,325 feet from Shaft No. 2, which flooded Headings Nos. 4 and 5 and rose about 200 feet in Shaft No. 2 to within 91 feet of the collar. When work was resumed on March 25, it was found necessary to replace the supports over a considerable portion of this heading. At Heading No. 6 (East Portal), 6,053 lineal feet was excavated, of which 3,080 feet was supported. Swelling ground necessitated extra heavy supports and some areas of quicksand were encountered which delayed progress to some extent. The flow of water in this heading varied from about 1,300 gallons to 2,000 gallons per minute throughout the year.

Shaft No. 1 has been difficult to sink because of fine, running sand, and varying quantities of water under high pressure. During the year a total of 224 feet of shaft was excavated and timbered throughout up to February 21, 1936, when, due to these adverse conditions, work was finally suspended. Since that date, drifts have been excavated at different levels in an effort to intercept the water and running sand. This work has been successful, for we now have the water and sand under control and it is estimated that the shaft will be sunk to tunnel grade by about the latter part of April or the first part of May, 1937.

Shaft No. 2, which is 359 feet deep, was completed and put in operation July 9, 1935. Excavations for the transformer station, battery charging station, pump station, and surveyors' drift, were completed early in October, 1935, and driving of Headings Nos. 4 and 5 started.

Cain Ranch camp, headquarters for Grant Lake Dam construction activities, has been enlarged and is now equipped to feed and house approximately 165 men.

Because of the severe weather conditions, stripping operations at the dam site were suspended in September, 1935, and resumed in April, 1936; and at the close of the past fiscal year a total of 334,120 cubic yards had been excavated, which includes 3,400 cubic yards excavated during the previous fiscal year, and which represents 90% of the total yardage to be stripped.

Excavation of the outlet tunnel from Grant Lake was completed. This tunnel is 3,412 feet long and was started in December, 1935, and holed through on May 24, 1936. The tunnel was supported throughout with tunnel steel rib sets and portable lagging. Equipment has been installed for mixing and placing the concrete lining, which work will soon be in progress.

Construction is well advanced on the earth ditch to divert water from East Portal back into Rush Creek for irrigation purposes. Excavation from this ditch was 18,600 cubic yards at the end of the fiscal year. The by-pass ditch to divert Rush Creek during dam construction was completed. Total excavation is 9,580 cubic yards, of which 6,650 cubic yards was excavated during the previous fiscal year.

To provide sand and gravel for concrete work in connection with Grant Lake Reservoir and other points on the Mono Basin Project, a portable crushing and screening plant with an output capacity of 400 cubic yards for an eight-hour day was erected approximately three miles east of Cain Ranch camp. In connection with the operation of this plant, it was necessary to construct two miles of road, and a twenty-ton bridge across Rush Creek.

In connection with the construction of the Long Valley Dam, the work of reconditioning the old buildings and the erection of the new ones was completed.

Stripping operations at dam site No. 1 disclosed unfavorable conditions, and operations were suspended September 10, 1935, after 81,749 cubic yards of rock had been removed. A more favorable site was located 2,000 feet upstream, and stripping operations at this location, which is known as dam site No. 2, were begun immediately. Some 372,800 cubic yards of earth and rock have been removed as of June 30, 1936.

Water for hydraulic stripping purposes was pumped directly from the Owens River by two pumps installed in a compressor house. Excavation is under way on the spillway and diversion tunnel, 425 feet having been driven to date. The tunnel is supported, where required, by steel or timber sets on five-foot centers, with timber lagging. A total of 6,630 cubic yards of earth and rock have been removed from the approach cut to this tunnel, and 5,800 cubic yards of rock have been excavated from the spillway forebay.

The work of trimming, regrading, and concrete lining the outlet tunnel and adit No. 1 is completed. The repairing and remodeling of the rock and gravel plant was completed, including the erection of a new hoist house. The output of this plant for the fiscal year was 19,833 cubic yards, which was used in various concreting operations.

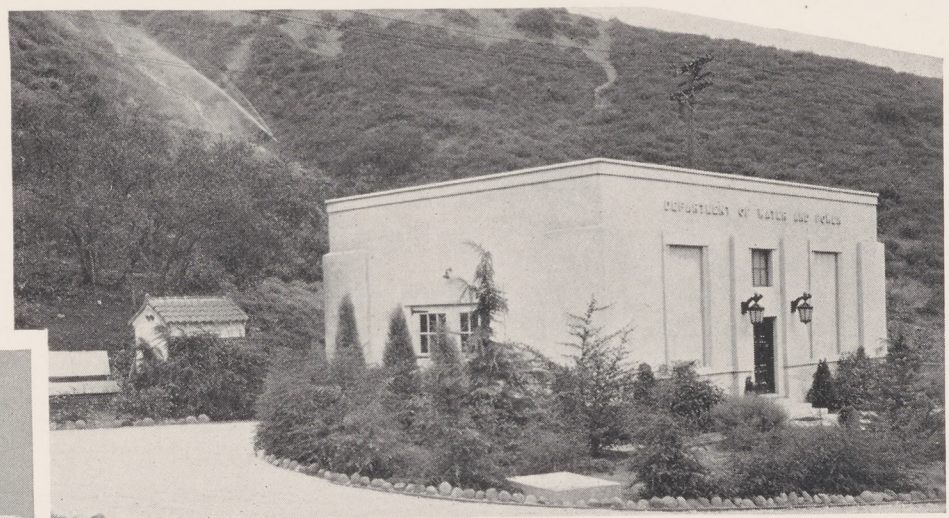
In October, 1935, notice was received from the Federal Emergency Administration of Public Works that the President had approved the Department's application for a grant, and on April 11, 1936, an offer was received from the United States of America to aid in financing the construction of additions and improvements to the distribution system and Owens River Aqueduct supply line of its City waterworks system by making a grant to the City of Los Angeles in the amount of 45% of the cost of the project upon completion, as determined by the Federal Emergency Administrator of Public Works, but not to exceed, in any event, the sum of $2,195,361. The cost of the project was estimated at $4,878,000.

This work is well under way and it is anticipated that all of the items included thereunder will be completed early in 1937. The project consists of necessary additions and betterments to the system which ordinarily would be carried on over a period of three or four years. The performance of this project has been of great benefit in relieving the unemployment situation during the period of economic depression, and has resulted in a financial benefit to the Department as well.

In conclusion, I will state that from a standpoint of service, the collecting and distribution system of the Bureau of Water Works and Supply is in far better condition than it has ever been in the history of the Department, due to the Department's policy to constantly improve both its service and its relations with the public.

Respectfully submitted,

H. A. VAN NORMAN,
Chief Engineer and General Manager.



The municipal Water Bureau's program for beautification of its properties includes architectural and landscaping features, as shown by these representative examples: (Top) Hollywood Reservoir Pumping Plant and Chlorination Plant below Mulholland Dam. (Center) Laurel Canyon Pumping Plant, with covered reservoir in background. (Bottom) Stone Canyon Chlorination Plant.

Water System

WM. W. HURLBUT, *Engineer of Water Works*

IN OCTOBER the Federal Emergency Administration of Public Works gave final approval of the application for additions and betterments of the water works system, involving an expenditure of $4,878,000, 45% of which was an outright grant. In excess of $4,000,000 is being expended in improving the water distribution system; the balance on improvements along the Los Angeles Aqueduct. This work is still under way and will be completed during the early part of 1937. The largest single unit included in this program is the 36-inch welded steel Stone Canyon Trunk Line, approximately 15 miles in length and estimated to cost $1,127,000. This line will provide an additional supply of water to the southern part of the city and greatly increase the pressure in that area. In addition thereto it will provide at all times an adequate supply to the Harbor District by its connection with the new 31.4 inch diameter steel trunk line which was put into operation October 22, 1935.

The total mileage of mains included in this P.W.A. program is 122.5, of which 39.7 miles vary in diameter from 16 to 40 inches, 73 miles of 8-inch and 12-inch diameter pipe, and 9.8 miles of 6-inch. This betterment to the distribution system is spread throughout the entire city area. Sixty-three and one-half miles are being constructed in the San Fernando Valley.

The program provides in addition two major and three minor pumping plants and three concrete reservoirs and tanks.

The complete installation of residual chlorination equipment in all stations is also provided for in this program.

The construction of a storm wall, fencing, and complete paving of the roadway around the Upper and Lower Hollywood Reservoirs is a major item in this program that will divert in the future all storm waters from entering this reservoir.

This program also includes the construction of new inlet tunnels to the Ivanhoe and Silver Lake Reservoirs and a new outlet tower and tunnel from the latter. This improvement will greatly increase the supply into the business section of the city.

The average daily pumpage for the year was 52,036,000 gallons, which is a decrease of 9,464,000 gallons or 15.5% as compared with the previous year (61,500,000). Of this plant output, 38.7% was pumped from wells and 61.3% was pumped from one zone to another.

Consumption of water for the fiscal year amounted to 346.4 second feet, of which 271.3 second feet or 78.3% was from the Los Angeles Aqueduct source and 75.1 second feet or 21.7% from the Los Angeles River and local wells source. The total consumption for the year just closed is an increase of 55 second feet or 18.9% over the previous year. This is the greatest annual increase in the history of the Department.

The rainfall during the past season amounted to 12.07 inches or 21.2% below normal. February received 7.25 inches or 60% of the year's total precipitation.

Storage in all reservoirs as of June 30, 1936, was 140,660 acre feet. Of this amount, 39,370 acre feet was in the local storage reservoirs within the city. There was a loss of 3,520 acre feet in total storage during the year. The greatest storage in all reservoirs occurred on February 15 when 145,660 acre feet was impounded. This was the maximum amount impounded at any time in the history of the Department.

With reference to the sanitary control of the water supply, I wish to call attention to the great number of samples that were taken throughout the year to protect the quality of the water. During the year just closed 38,035 tests were made in the laboratory. Another important development in connection with the Sanitation Division and the draft of water from the reservoirs is the control that is now obtained through the Sanitation Division tests of depth samples from various outlets from the reservoir towers. This has resulted in the draft of water from the reservoirs to be from the strata found to be in the best condition. Particular attention is also called to the progress being made by the Sanitation Division in the elimination of cross-connections, 575 individual cross-connections having been eliminated during the present fiscal year.

Particular attention is called to the application of copper sulphate to the reservoirs to control algae and plankton growths. The method developed and used throughout the entire past year has been that of blowing granular copper sulphate, getting 100% coverage of all reservoir basins. The economy effected by this use has amounted to approximately seven tons of copper sulphate during the year.

Spreading of Owens River Aqueduct water was carried on at Tujunga Spreading Grounds from October, 1935, to May, 1936, inclusive. The amount contributed to the groundwater storage was approximately 19,900 acre feet as compared with 30,040 acre feet for the previous season. The rate of percolation for the 210-day spreading period was 5.52 acre feet per acre per day. In the south coastal plain the average drop of the groundwater as measured from the numerous wells in this district is 1.7 feet. The drop in groundwater storage has been somewhat uniform throughout all of the southern area due to the subnormal year of precipitation.

The purchase of cast iron pipe during the year amounted to 15,768.33 tons or an equivalent mileage of 97.89. The average cost of this pipe f.o.b. our yards or trenchside was $48.977 per ton as compared to a cost of $49.58 per ton for the previous year. The purchase of welded steel pipe varying in diameter from 24 to 36 inches and from 3/8 to 9/16 inch in thickness for the year just closed amounted to 22.57 miles, the equivalent being 9,146 tons, at a total purchase price of $672,230.

A total of 65.768 miles of mains were laid in the distribution system, of which 28.921 miles were laid in the Main City District, 8.334 miles in the Harbor District, and 28.513 miles in the San Fernando Valley District.

Of the above amount of pipe that was laid in the entire system, 47.067 miles were of cast iron. The total mileage in the distribution system as of June 30, 1936, was 3,897.77 or a net gain to the system of 42.772 miles. Not included in this mileage are 54.21 miles of pipe smaller than 4 inches in diameter, considered temporary mains. The total amount of cast iron pipe in the system is 2,911.639 miles, which is 75.213% of all pipe in the entire system. Particular attention is called to the accompanying tables in this report entitled "Cast Iron Pipe Summary."

During the second week of June the fifty-sixth annual convention of the American Water Works Association was held in Los Angeles. The Bureau of Water Works and Supply, together with the California Section of the Association, was host to this gathering on Saturday, June 12, when the visiting delegates were taken on an extensive automobile trip visiting the larger reservoirs of the system and several pumping plants. I wish to thank the entire personnel of the Bureau of Water Works and Supply for their untiring efforts in making the visit of the delegates of the American Water Works Association a most successful one. To them and the Department as a whole a great deal of credit is due for a most successful convention.

The Bureau of Water Works and Supply takes particular pride in pointing out at this time the extensive scope of the beautification program that has been carried out on its properties, and this phase of our work has been very generally commented upon by the leading water works engineers and superintendents from all over the country visiting our city.

The distribution system as a whole is in better condition than at any time in the history of the Department.

TABULATION OF WATER CONSUMPTION IN THE CITY OF LOS ANGELES

FOR THE YEARS ENDING JUNE 30, 1930-36

	Domestic		Irrigation		Total	
	Sec. Ft.	Mil. Gals. Daily	Sec. Ft.	Mil. Gals. Daily	Sec. Ft.	Mil. Gals. Daily
1930	255	165	115	74	370	239
1931	248	160	112	72	360	233
1932	241	156	100	65	342	221
1933	231	149	85	55	316	204
1934	222	143	90	58	312	202
1935	214	138	77	50	291	188
1936	240	156	106	68	346	224

REPORT OF WATER CONSUMPTION IN THE CITY OF LOS ANGELES FOR THE FISCAL YEAR 1935-36

	Domestic		Irrigation	Total
		Mil. Gals.		
	Sec. Ft.	Per Day	Sec. Ft.	Sec. Ft.
July	285.3	184	237.7	523.0
August	286.5	185	229.6	516.1
September	251.5	163	149.7	401.2
October	238.0	154	82.6	320.6
November	201.9	130	39.7	241.6
December	201.6	130	35.2	236.8
January	208.4	135	30.3	238.7
February	177.6	115	10.8	188.4
March	211.1	136	65.9	277.0
April	230.5	149	30.0	260.5
May	284.6	184	148.0	432.6
June	308.9	200	211.8	520.7
Mean	240.5	155	105.9	346.4
Mean—Summer	274.6	177	167.8	442.4
Mean—Winter	206.4	133	44.0	250.4
Peak—July 15-22	305.3	197	284.0	589.3

Total Rainfall for Season ..... 12.07 Inches (21.2% below normal)

Los Angeles River Supply	63.5	Second Feet
Pollock Wells	4.6	Second Feet
Harbor Wells	4.2	Second Feet
Mission Wells	2.8	Second Feet
Total Local Supply	75.1	Second Feet (21.7%)
Aqueduct Supply	271.3	Second Feet (78.3%)

Los Angeles Aqueduct

J. E. PHILLIPS, *Engineer in Charge*

CONSTRUCTION and maintenance work in the Aqueduct Division was curtailed to a considerable degree during the past fiscal year as compared with that of former years. This has been due not only to lack of funds, but partly because the physical condition of the aqueduct was such that, in so far as maintenance was concerned, very little work was vitally necessary and could be deferred, and also because an extensive improvement program was being developed as a Public Works Administration Project for the year 1936-1937. In anticipation of this program, energies were directed toward the making of surveys and the preparation of plans and estimates for this work. These will be hereafter referred to more specifically.

The records show that the average flow of the aqueduct into Haiwee Reservoir during the last fiscal year amounted to 357 second feet, and that the outflow from Haiwee Reservoir was 343 second feet. The following table shows comparisons for the last three years:

Year	Average Pumped	Average Surface Supply	Average Inflow into Haiwee
1933-34	13	315	328
1934-35	52	273	325
1935-36	0	352	357

There was no pumping of the deep wells in 1935-36, but during this period there was an artesian flow of five second feet.

Reports on rainfall and snow surveys in 1935-36 indicate that the surface flow will meet the demand during the coming year, and that the pumping of wells in Owens Valley probably will not be necessary.

The total rainfall in Independence for the fiscal year 1935-36 amounted to 6.53 inches, which is 136% of normal. The total rainfall in the City of Los Angeles for the same period was 12.07 inches, which is 79% of normal.

According to the snow surveys, the estimated forecast for the hydrographic annual mean flow of the Owens River at Gorge Station at the lower end of Long Valley is 208 second feet for the present year. The estimate for 1935 was 172 second feet and the actual run-off was 179 second feet, showing that a high degree of accuracy in estimating is attained.

Water spreading in the Owens Valley during 1935-36 amounted to 49,982 acre feet. The greater part of this water was spread during the months of February, March, and April, 1936, the purpose of which was twofold: first—the snow surveys of the previous winter indicated that there would be sufficient run-off during the coming summer to more than meet the current demand and fill our surface reservoirs; secondly—the run-off during the early spring months, coming principally from the melting of snows on the floor of Long Valley, carried a high percentage of boron. Due to the possible effect this boron might have on the citrus crops in the San Fernando Valley, it was deemed desirable to spread this water in the Owens Valley where it would seep into the underground storage basin to be later pumped as needed.

HYDROGRAPHY

The Hydrographic Section of this division prepared various studies during the year 1935-36 which were used to aid in the prevention of creek channel losses and for reference in planning future work.

The diversity of records prepared by this section is shown by the following list: graphical studies showing the records of deep wells, reservoirs, precipitation, and streams; readings and tabulations of seepage studies at Tinemaha, Haiwee, Fairmont, and Dry Canyon Reservoirs; evaporation studies on Dry Canyon, Bouquet, Fairmont, Haiwee, and Tinemaha Reservoirs, and the Owens River at Long Valley; a compilation of four years' observations of creek channel losses in the Independence area in an effort to effect future conservation; investigations and reports on all applications to appropriate waters in the areas from which the aqueduct water supply is drawn; preparation of data for court use in protection of water rights; and snow surveys once a month during January, February, March, and April on courses in Cottonwood, Big Pine, and Rock Creek Basins, and on Mammoth and Minaret Summits.

The section cooperated with the United States Geological Survey, United States Department of Agricul-

ture, California Division of Water Resources, Santa Clara Conservation District, Nevada Cooperative Snow Surveys, Los Angeles County Flood Control District, and several other organizations outside of the Department of Water and Power in the exchange of pertinent data.

To assist in measuring and accurately computing the flows of the Los Angeles Aqueduct and the Owens River with its tributaries, the Hydrographic Section had installed and in operation the following mechanical devices: 122 water stage recorders, 89 manually operated gauging stations, 50 Venturi flumes, 90 weirs on principal streams, 4 submerged orifices, and 20 Sparling meters.

The Hydrographic Section made 1200 current meter measurements, 3240 deep well readings, and 2800 shallow well ground water readings. From the data obtained, 600 quarterly report sheets were prepared.

To illustrate the degree of accuracy being obtained by the lengthening period of snow survey records, the following table of estimates and subsequent actual flow is submitted:

Year	Estimated Run-off	Actual Run-off	Actual Run-off in Per Cent of Estimated	Remarks
1927	483	356	73.7	7 Mo. Period
1928	295	250	84.7	6 Mo. Period
1929	248	206	83.0	6 Mo. Period
1930	122	131	107.4	6 Mo. Period
1931	77	79	102.6	6 Mo. Period
1932	204	189	92.6	Mean Annual
1933	144	161	111.8	Mean Annual
1934	140	129	108.5	Mean Annual
1935	172	179	96.1	Mean Annual

SUMMARY OF SNOW SURVEYS SHOWING COMPARISON WITH 1927 WHICH IS CONSIDERED A NORMAL YEAR

FIGURES SHOW WATER CONTENT IN INCHES

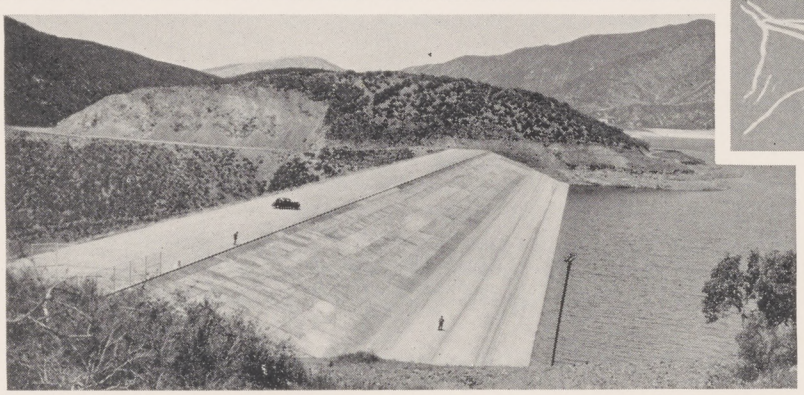
DATE	Rock Creek No. 1 Elev. 8,700	Rock Creek No. 2 Elev. 9,050	Rock Creek No. 3 Elev. 10,000	Cotton-wood Creek No. 1 Elev. 10,600	Cotton-wood Creek No. 2 Elev. 11,100	Big Pine Creek No. 2 Elev. 9,700	Big Pine Creek No. 3 Elev. 9,800	Big Pine Creek No. 1 Elev. 10,000	Mina-ret No. 2 Elev. 9,000	Mina-ret No. 1 Elev. 8,300	Mam-moth No. 1 Elev. 9,500	Mam-moth No. 2 Elev. 8,300
1927—March	13.31	13.91	17.60	.....	.....	24.97	27.53	36.61	36.00	25.28	.....	.....
April	.....	.....	.....	14.20	16.80	18.97	18.92	.....	.....	.....	.....	.....
May	.....	.....	.....	.....	.....	.....	.....	31.13	31.44	8.48	46.23	8.55
1931—March	Bare	Bare	2.33	0.55	3.71	1.91	1.84	4.18	10.97	5.37	15.54	6.27
1932—April	10.88	11.00	17.20	18.12	16.62	21.78	21.92	32.16	40.60	26.44	57.34	25.80
1933—April	5.19	4.89	7.83	6.09	7.95	13.90	11.10	17.90	23.20	14.20	31.58	14.50
1934—April	Trace	Trace	4.44	2.89	6.94	9.66	11.08	16.08	16.29	3.96	21.73	6.10
1935—April	9.00	8.70	12.10	9.83	11.35	12.81	10.81	19.58	27.74	18.30	40.65	17.40
1936—January	2.22	3.35	2.94	4.91	4.46	8.53	6.80	12.18	7.97	4.85	10.02	4.07
February	11.88	12.65	12.48	11.78	10.21	14.59	11.97	18.05	28.31	20.54	34.04	18.53
March	15.41	15.96	17.83	13.62	11.89	25.44	19.36	31.75	33.69	26.06	44.63	24.23
April	14.72	15.11	17.63	15.58	14.40	21.66	14.56	31.42	39.10	27.83	49.10	24.30

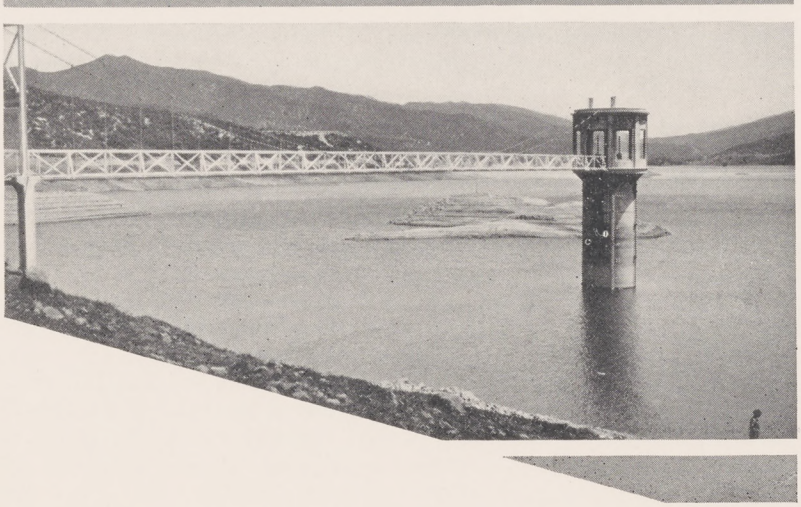
MAINTENANCE

AQUEDUCT:

As part of the regular routine, the aqueduct was inspected from the Intake to Fairmont Reservoir. As a result, repairs, which obviated the possibility of future trouble, as well as those needing immediate attention, were made. In addition to this specific inspection, constant supervision was maintained to keep the aqueduct in good condition.

Repairs, in general, were of a minor nature. Twenty-five rock spillways from station 345+00 to station 1178+00 in Red Rock Tunnel, spillway and footwall at station 410 in Dove Springs, and footwalls from sta-





Newest major storage basin in the Los Angeles municipal water system is Bouquet Canyon Reservoir. (Top) General view of Reservoir. (Center) Dam, with automobile on crest road affording size comparison. (Bottom) Outlet tower and connecting bridge.

tion 345+00 to station 560+00 were excavated and grouted to prevent flood waters from exposing side walls and undermining the aqueduct. Rock dikes were placed on both sides of the spillway channel from Little Lake Gates, and the flood control dike at station 1178+00 was repaired. Wing walls under the Nine Mile Siphon were renewed to increase clearance for flood waters. Damage caused by twenty-five washouts necessitated various types of restoration work. Minor leaks were caulked in the conduit at the south transition of Pine Canyon Siphon. Portions of the side walls at the north transition of Nine Mile Siphon, near station 882+00 in the Grapevine Division, and from station 140+00 to station 460+00 in the Dove Springs Division were plastered. The outside of Jawbone Siphon was painted for 1050 feet, and work was started to strengthen the Water Canyon Flume in the Jawbone Division.

The usual routine was maintained of patrolling the aqueduct system from five to seven days per week from the Intake to San Fernando as a protection to Department property and facilities, and to insure a continuous flow of water through the aqueduct.

Construction work along the aqueduct was less than normal, the most extensive work being the excavating and pouring of nineteen reinforced concrete piers: ten at Nine Mile Siphon, five at Pine Canyon Siphon, and four at Jawbone Siphon. A twenty foot section of new bottom was installed in Red Rock Tunnel. A footwall 110 feet long was built at Cameron Wash. A dike to carry away flood waters was erected at station 1115+00 in the Pinto Hills Division. Round manholes in Pinto Flats were replaced by square manholes 2'6" x 2'6". A sand trap and settling basin 700 feet long and 40 feet wide, was excavated at Shepherd Creek. A concrete retaining wall at the end of the lined canal near North Haiwee and a retaining wall and spillway at Midway Canyon were built. Rock walls were constructed along the aqueduct near Diaz Creek, north of overhead 32, and at Black Rock Springs.

Advantage was taken of the shut-off of the aqueduct in the Owens Valley Division during February and March, 1936 to clean the aqueduct from Shepherd Creek to Haiwee Reservoir. Some accumulation of sand had occurred in the unlined canal at Shepherd Creek, Bairs Creek, and Georges Creek, having been brought down during the previous high water of these creeks and deposited in the aqueduct at those points. Very little accumulation of sand and rocks had occurred in the lined canal, but such as did exist was removed at this same time.

Accumulated deposits of rock and sand were removed from the spillways in the Dove Springs section and from the overheads between the Alabama Hills and Haiwee. The overburdens on top of the conduit were removed from station 435+00 to station 462+00 in the Jawbone Division and at the south end of Nine Mile Siphon. Spoil banks were leveled with power shovels from the west side of the aqueduct south of Lone Pine, the west side of the lined canal near Ash Creek, for 6460 feet along the west side of the unlined canal near Black Rock Springs, and for 1450 feet along the lined canal north of North Haiwee.

Destruction of willows and weeds was accomplished by spraying with oil, a method which has been effective in retarding these growths. The banks were sprayed in Fairmont Reservoir and for twenty-four miles from the Intake to the Alabama Hills. Eel grass was cut and tules were grubbed from the aqueduct banks for a distance of fifteen miles.

Water channels in Long Valley, Bishop, Big Pine, and Independence areas were cleaned.

AQUEDUCT INTERRUPTIONS:

There were no involuntary interruptions in the aqueduct flow south of Haiwee Reservoir. However, during the inspection trip in March, the shut-off period was prolonged to install a new twenty-foot bottom in Red Rock Tunnel.

In the Owens Valley Division there was one involuntary shut-down to recover the body of an Indian boy.

The aqueduct was shut down for 945 hours, or a total of 10.8% of the elapsed time.

The following tabulation gives a complete record of interruptions:

Date of Shut-Off	Division	Hours Off	Remarks
August 28, 1935	Owens Valley	45½	To recover body of Indian boy
October 10, 1935	Mojave	8½	Inspection
December 8, 1935	Saugus	8	Inspection
February 14, 1936	Owens Valley	408	Inspection and cleaning
March 15, 1936	Saugus	6½	Inspection
March 16, 1936	Mojave	101½	Inspection and installation of 20' new bottom Red Rock Tunnel
March 19, 1936	Owens Valley	365	Inspection and cleaning
	Total Hours Off	945	

ROADS:

The aqueduct system contains a network of roads which must be kept in condition suitable for daily patrol and provide easy access to the aqueduct in the event emergency repairs are required. The usual maintenance work on all roads was carried out during the past year.

To prevent sluffing, a retaining wall 402′ long and 5′3″ high was built along Jawbone road, and the steep banks along Cliff Canyon road were sloped. Roads were widened from Dead Horse Adit to the highway and from Wickline to Lost Canyon.

HOUSES AND BUILDINGS:

In line with the policy of the Department to maintain its buildings in the Owens Valley and along the line of the aqueduct in good repair, a large scale painting program was inaugurated this last year and 64 houses were selected as being badly in need of paint. These houses were given one or two coats, as required, of white lead paint, and the roofs were painted green. These standard colors are maintained throughout the Valley in Department owned houses. It is expected that this painting program will continue next year and that Department owned houses will be painted as their conditions demand.

Throughout the entire division, minor repairs were made on 262 buildings. Roofs, floors, flues, plaster, plumbing, and electrical equipment were reconditioned.

An old construction camp and power line in the San Francisquito Canyon were dismantled.

WELLS AND PUMPING PLANTS:

During the last year, the surface run-off supplied the demand on the aqueduct system and it was not necessary to pump the wells. However, to guard against a possible water shortage the wells remain equipped with pumps at all times. During periods when the wells are not producing, the pumps require periodic greasing and running to keep them from "freezing."

MACHINE SHOP:

The machine shop, in the performance of its duties, cooperated with the aqueduct maintenance, operation, and construction forces, and with the construction forces on the Mono Basin Project, in the fabrication and repair of equipment. Following are a few of the items fabricated or repaired: gate lifts, pipe joints and collars, visibility strips, still wells, rams, weir lips, register floats, digging bars, pipe caps, roof jacks, a two-wheeled trailer, Sparling meters, pumps, motors, hydrographic equipment, transformers, and construction equipment in general which was maintained in good working order.

GARAGES:

The garages at Independence and Mojave maintained local cars in good operating condition, many overhauls being performed. In Independence, betterment in service of painting cars has been established and a number of cars, trucks, and trailers were painted during the year. The garages also furnished gasoline, oil, and emergency service to Department motor vehicles passing through their stations. At Independence a saving in gasoline costs has been effected by the installation of a 3500 gallon storage tank.

MISCELLANEOUS ITEMS:

A few of the more important miscellaneous additions, and work, deemed necessary in the maintenance and operation of the Los Angeles Aqueduct during the past year are as follows:

Constructed a 5500 gallon water tank, 6″ pipe line, pump, and motor at well No. 255 in Lone Pine to furnish water to Department employees, Simmons Tract, and Lone Pine yards. Due to age and corrosion of pipes it was necessary to install new water lines in the Mojave yards. Installed pipe lines and fire hydrants for fire protection in Bishop yards. In Independence 10 fire hydrants were installed and locations of 5 fire hydrants were changed for more adequate fire protection. Extinguished 63 brush fires which burned over from a half acre to 60 acres of land, respectively, with no serious damages resulting from any of these fires due to the efficiency of Department employees in meeting these emergencies. Minor adjustments were made in the sewer system at Lone Pine, leaks were stopped, excavations filled, installations of new services made, and the Imhoff tank was skimmed about twice a month. Minor adjustments were made to the Big Pine water system.

A bridge near Bishop, Kearsarge bridge, and the Keeler bridge were reinforced to provide greater safety for the passing of heavy loads. Rodents were exterminated in the vicinity of Fairmont Reservoir. Triangulation surveys were made in the area from Manzanar to Big Pine. Supervision was maintained over the uses of irrigation and domestic water from Mono Basin to Haiwee. Plans and estimates were prepared for betterments and additions to Department owned property and buildings.

NEW CONSTRUCTION

PUBLIC WORKS ADMINISTRATION IMPROVEMENT CONSTRUCTION PROGRAM:

Final negotiations are about completed whereby the Department is to carry on a construction and improvement program in conjunction with the Public Works Administration. In the near future work will begin on the following projects:

1. Sewer system to serve all City owned buildings in the town of Independence.
2. A new reinforced concrete machine shop of adequate size to meet the present and future needs of the Department at Independence.
3. Settling basins to be excavated on Independence Creek, Goodale Creek, Bairs Creek, and Georges Creek to prevent mud and sand from flowing into the aqueduct.
4. To assist the Hydrographic Section in compiling more accurate records on stream flow and underground water levels, concrete flumes will be installed in Rush Creek, Independence Creek, Shepherd Creek, Georges Creek, and Bairs Creek.
5. It is proposed to drill six new wells, equip these six wells and approximately twenty others with automatic recording instruments.
6. A new concrete lining will be installed in portions of the open lined canal in the Olancha Division.
7. Haiwee crest will be leveled and an 18″ rubble wall constructed on the upstream face of the dam to prevent spray during high water from blowing on to the dam.
8. A new reinforced concrete warehouse is to be built at Mojave to replace the structure which has been in use since the old aqueduct construction days.
9. In line with the policy of paralleling the entire aqueduct system with roads, it is proposed to build new roads in No Name Canyon, Wickline Canyon to Kelly Hole, End Canyon to Lost Canyon, Grapevine Canyon, and from Boulder Peak to bottom of Sand Canyon.
10. To facilitate the transportation and patrol along the line of the aqueduct, it is proposed to construct twelve cattle guards in the Mojave and Antelope regions.
11. Four new concrete houses will be constructed, one each at Fairmont, Mojave, Sand Canyon, and Little Lake.
12. Three garages are to be built, one each at Antelope, Dove Springs, and Sand Canyon.
13. A concrete shaft, approximately 90′ in depth, will be sunk over Red Rock Tunnel.
14. Due to the high winds in the Mojave Desert, the roads in the Mojave yards and at Fairmont Reservoir will be oiled to prevent excessive dust being raised in these localities.
15. Approximately four and one-half miles of new main telephone line will be installed in the Saugus Division.

Distribution, Construction and Operation Division

THOMAS BROOKS, *Engineer in Charge*

DURING the fiscal year ending June 1936, the varied activities of the Department bring to light the following unusual endeavors.

PIPE SYSTEM

The Harbor Trunk Line construction is considered the outstanding individual job, consisting of 62,774 feet of 31.4" inside diameter electric welded steel pipe, and was completed with the chlorination of the line and turning on of water on October 22, 1935. Construction of this main was started at the two ends, Western Avenue at 98th Street and Normandie Avenue at Anaheim Blvd., using S.E.R.A. labor. When approximately half finished, the S.E.R.A. labor was withdrawn, and it was necessary to complete the job with the Department's trenching machines.

This pipe was fabricated locally of 3/8" steel plate, and coated inside and outside with coal tar enamel in the Department's coating plant at the Slauson and Compton yard. Joints in the pipe line were caulked with cement.

At the north end connection was made to the 30-inch Western Avenue Trunk Line which is supplied through regulators with Hollywood Reservoir and Stone Canyon Reservoir water. At the Harbor end the line was connected into the Anaheim Blvd. lines in such a manner that the supply of water can be regulated to the Harbor City and San Pedro Reservoirs. Connections through a regulating valve was also made to our mains in the Torrance district.

A test for leakage in the cement joints of this pipe line was made in December, and an average of 3.28 gallons per inch diameter per mile of line per day was obtained. This figure is to be compared with figures of 100 to 200 gallons per inch diameter per mile per day usually allowed for water lines installed by contract.

On the Hoover Street Trunk Line at Silver Lake Blvd., due to re-alignment and construction for grade on Silver Lake Blvd., sixty-eight feet of 30 inch steel and cast iron pipe was relocated. This work was complicated in that it necessitated two individual changes to complete the improvement.

The construction of the Gaffey Street bridge in San Pedro at Oliver Street made necessary the relocation of five hundred and ninety-six feet of 20 inch cast iron pipe. This pipe formerly supported by bents parallel to the old wooden structure was removed and placed on the new concrete bridge in available space.

One hundred and eighty-five feet of 24 inch cast iron pipe of the Ascot Trunk Line was relocated on Huntington Drive, South, at the juncture of Mission Road for the grade separation. This construction required an off-set around the abutments of the bridge. Similarly, on Soto Street at the Valley Blvd. grade separation, a relocation of two hundred and forty feet of 12-inch cast iron pipe was involved.

Two hundred and twelve feet of 36-inch by 3/16-inch steel pipe was coated with Bitumastic No. 14 paint and lowered in Sunset Blvd. east of Horn Ave. in advance of paving.

On San Fernando Road, a line of one hundred and six feet of 12-inch cast iron pipe was necessarily relocated for the Figueroa Street Viaduct construction.

Eight hundred and thirty-one feet of 12-inch cast iron pipe was removed on Macy Street for relocation pending the construction of the Macy Street grade separation for the new Union Station.

Four separate jobs in the extension and betterment group totaled seven thousand six hundred and forty nine feet of 12-inch cast iron pipe, comprising:

(1) Three thousand one hundred and seventy-six feet in Mandeville Canyon Road from the intersection of Westridge Road to three thousand one hundred and sixty-four feet north;

(2) Two thousand five hundred and eighty feet on Alviso Avenue from Slauson Avenue to 64th Street with a connection to smaller cross mains at nearly all intersections;

(3) One thousand four hundred and ninety-nine feet on the east side of Vermont Avenue from 79th Street to 83rd Street paralleling the Street Railway and giving the advantage of a double main;

(4) Four hundred and four feet on Sunset Blvd. west of Groverton Place.

There were 68 cases of failure of cast iron mains in the City and Harbor districts, as shown in the accompanying tabulation. (See pages 20, 21 and 22). The apparent causes of the failures are as follows:

Settlement of ground	33
Defective pipe	8
Excessive pressure or water hammer	2
Graphitic corrosion	9
Contractors' equipment	5
Undetermined	11

TANKS AND PRESSURE REGULATORS

All kickback tanks with their altitude valves, and all pressure regulators were inspected weekly, and all adjustments and repairs promptly made.

In November, 1935, the Verdugo Tank was sand blasted on the outside and painted with two coats of red lead and one coat of green aluminum. The wooden roof was also painted with green aluminum.

The Beverly Glen Tank was cleaned on the outside in December, 1935, and painted with red lead and green aluminum. The roof was given two coats of aluminum paint.

The Finley Avenue Tank was drained and cleaned thoroughly in December, 1935. The enamel coating on the inside was patched in a few small spots. The exterior of the tank was brushed and painted with red lead and green aluminum.

In April, 1936, the Tyrolean Drive Tank was cleaned and painted on the outside. Green aluminum paint was used.

Tank maintenance work in May, 1936, consisted of cleaning and painting of the exterior surfaces and roofs of the Innsdale Drive Tank and the Mulholland Tank. Red lead primer was used with a finish coat of green aluminum paint.

Means of regulating the supply of water to Ascot Reservoir was improved with the installation in December, 1935, of a 16-inch rotary plug valve. This valve is located on Workman Avenue at Avenue 28, and is manually operated from the curb by means of shafts and gearing. The position of the valve is indicated by a revolution counter visible to the operator while turning the valve.

In June, 1936, a 20-inch automatic rotary plug type pressure reducing valve was installed in Gramercy Place at Washington Blvd. This resulted in considerable improvement in the supply to the Harbor district.

ELECTROLYSIS SURVEYS

The Electrolysis Section has been accumulating data, and now is preparing corrosion and electrolysis maps of the Metropolitan, Harbor, and San Fernando Valley Districts. Soil classifications are shown, using the United States Bureau of Soil Classification data and data from tests of soils in place and laboratory tests of soils. Actual corrosion experience data gleaned from reports of pipe failures give valuable indication of the accuracy of the different test methods used for determining the corrosivity of different soil areas. Nine hundred and eighty-three earth resistivity and two hundred and twenty-four A. G. A. nipple and can tests were made in this connection during the year.

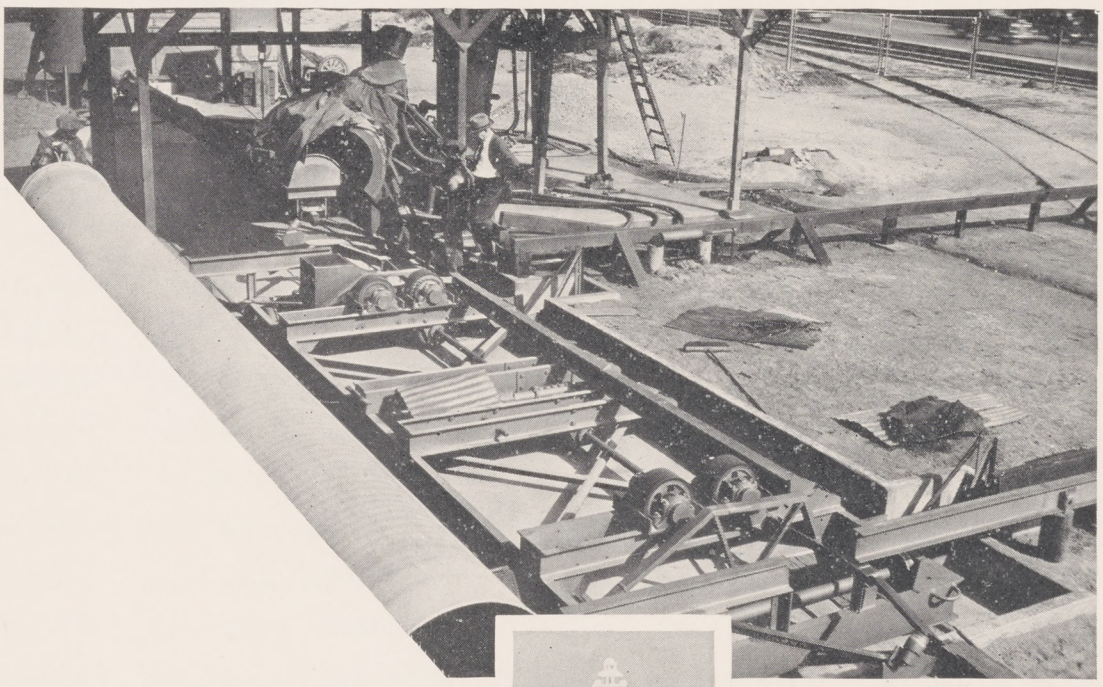
Rather limited areas of severely corrosive soil were found to be the cause of leaks in large steel mains in Western Avenue near Slauson Avenue, and in Lankershim Blvd. at Archwood Avenue.

Five special investigations were made on consumers' premises of corrosion complaints, finding nothing for which the department was responsible.

Field tests made include McCollum Meter Earth Current Determinations at two locations, and one hundred and ninety-nine 24-hour records of electrical potentials and current flow between rails and water mains.

Miscellaneous laboratory tests include twenty-two galvanic tests of zinc, cadmium and chromium plating, three soil analyses, and twenty-six breakdown tests of insulating protective coatings.

A chart and tabulation of activities of the Electrolysis Section for the past ten years appears on page 22.



(Top) Installing 31.4-inch bell and spigot steel pipe in Normandie Avenue section of Harbor Trunk Line. (Bottom) Pipe blasting carriage and equipment, Slauson Yard Pipe Coating Plant of Water Bureau.

RECORD OF BROKEN CAST IRON MAINS

MAIN AND HARBOR DISTRICTS

July 1, 1935 to June 30, 1936

Location	Size and Class	Date Broken	Age In Years	Type of Fracture	Probable Cause
4th Ave. 87′ S. of Slauson Ave.	6″ C. I. B.	7- 1-35	13	Small hole.	Undetermined.
Gaffey St. and 19th St. Harbor Dist.	8″ C. I. B.	7- 3-35	12	3′ Split.	Thin on one side.
Venice Blvd. 50′ E. of Oxford Ave.	24″ C. I. B.	7-13-35	21	Large section out.	Undetermined.
Grand Ave. 50′ N. of 1st St. Harbor Dist.	6″ C. I.	7-19-35	22	1″x5″ hole.	Graphitic corrosion.
74th St. 469′ E.E. Figueroa St.	6″ C. I. C.	7-19-35	18	2½″x14″ hole.	Graphitic corrosion.
Marengo St. E. of Cornwell St.	24″ C. I.	7-19-35	6	11 ft. crack.	Pulled out by equipment.
Potomac Ave. S. of Jefferson Blvd.	4″ C. I. B.	8-19-35	11	Broken straight around.	Settling of ground.
Bundy Dr. 75′ S. of Benmore Terr.	8″ Wood 350	9-11-35	17	Broken off.	Water hammer.
Yosemite Way 380′ N. of Ave. 42	4″ C. I. B.	9-16-35	11	Small sand hole.	Sand hole in casting.
Q St. 327′ W. of Wilmington Blvd. Harbor Dist.	6″ C. I. B.	9-21-35	11	Cracked under bail.	Graphitic corrosion.
15th St. 21′ W.W. Kenmore Ave.	6″ C. I. B.	9-29-35	10	Broken straight around.	Undetermined.
Ave. 39 60′ W. of Carlota Ave.	4″ C. I.	10- 3-35	11	Broken straight around.	Steam roller.
Westlake Ave. 200′ S. of 8th St.	4″ C. I.	10-11-35	32	2 ft. split.	Thin on one side.
Bartlett Ave. 10′ E. of Centinella Ave.	12″ C. I.	10-11-35	26	1 ft. x 10 ft. piece blown out.	Undetermined.
Redfield Ave. 214′ W. of Ebey Ave.	8″ C. I. B.	10-14-35	3	7″ split.	Undetermined.
Alpine St. 43′ W. of Broadway	6″ C. I. C.	10-17-35	10	Broken straight around.	Undetermined.
Cummings St. at Michigan Ave.	6″ C. I.	10-21-35	34	2″x2′ hole in bottom.	Undetermined.
Valle Vista Dr. 41′ E. of Yosemite Way	6″ C. I.	10-19-35	12	Broken straight around.	Undetermined.
Clinton Ave. 156′ E. of Rosemont Ave.	4″ C. I.	10-22-35	19	Broken straight around.	Pipe pitted and settled.
Edloft St. 325′ S. of Twining St.	6″ C. I.	10-25-35	Over 12	Broken straight around.	Settling of ground.
Mississippi Ave. 3′ W. of Kelton Ave.	12″ McW. 350	10-25-35	5	Broken straight around.	Settling of ground.
6th St. 105′ W. of Mariposa Ave.	12″ C. I. 350	10-26-35	5	8 ft. crack on top.	Thin pipe.
Cologne St. 15′ W. of Ernest St.	4″ C. I. B.	10-27-35	4	Broken straight around.	Heavy crane.
Hoover St. 16′ N. of 116th St.	12″ McW. 350	10-28-35	5	Broken straight around.	Settling of ground.
Eagle Rock Blvd. and York Blvd.	4″ C. I. B.	11- 5-35	9	Broken straight around.	Settled over storm drain.
Estrada St. 19′ W. of Concord St.	4″ C. I.	11- 5-35	13	Broken straight around.	Settling of ground.
Berendo St. 46′ S. of Beverly Blvd.	4″ C. I.	11- 7-35	Over 20	Broken straight around.	Settling of ground.
15th St. 38′ W. of Center St.	6″ C. I. B.	11-16-35	11	Broken straight around.	Settling of ground.
Banning St. 55′ N. of Wilmington St. Harb. Dist.	6″ Del. 250	11-18-35	10	Broken straight around.	Settled storm drain trench.

RECORD OF BROKEN CAST IRON MAINS—*(Continued)*

MAIN AND HARBOR DISTRICTS

July 1, 1935 to June 30, 1936

Location	Size and Class	Date Broken	Age In Years	Type of Fracture	Probable Cause
Charnwood Ave. 109′ S. of Valley Blvd.	6″ C. I.	11-27-35	10	Pipe shattered.	Settled sewer trench.
Smiley Dr. 240′ W. of Houser Ave.	4″ Del.	11-28-35	10	Broken straight around.	Settling of ground.
Pico Blvd. at Veteran Ave.	8″ Mono 350	11-30-35	5	Crack around nipple.	Defective pipe.
Dunleer Dr.	6″ C. I. B.	11-30-35	10	Broken off at tap.	Settling of ground.
Rochester Ave. W. of Thayer Ave.	6″ C. I. B.	12- 2-35	11	Broken off at tap.	Settling of ground.
Marathon St. 122′ E. of Windsor Blvd.	6″ Del.	12- 2-35	10	3 ft. piece blown out.	Settling of fill.
Monteagle Ave. 565′ W. of Ave. 45	4″ C. I. B.	12- 6-35	9	Broken straight around.	Settling of ground.
Gramercy Pl. 15′ N. of 106th St.	6″ McW. 250	12- 9-35	Over 6	3 ft. split.	Water hammer.
Annan Way 219′ W. of Figueroa St.	Reclaimed 4″ Del. 250	12-12-35	7/12	Half around on bottom.	Settling of ground.
Drew St. 150′ E. of Ave. 32	4″ C. I.	12-14-35	15	Broken in two.	Undetermined.
Alameda St. at Factory Pl.	12″ C. I.	12-14-35	28	Broken straight around.	Settling of ground.
Dunleer Dr. 17′ N. of Manning Blvd.	6″ Del. 250	12-17-35	10	Broken straight around.	Settling of ground.
Warnall Ave. 257′ S. of Comstock Ave.	6″ C. I. B.	12-26-35	11	Broken straight around.	Settling of ground.
Sierra Bonita Ave. at Wilshire Blvd.	4″ Del. 250	12-26-35	10	Broken straight around.	Settling of ground.
Meyler St. at 36th St. Harbor Dist.	4″ C. I. B.	1- 7-36	10	Crack straight around.	Graphitic corrosion.
Corning St. 18′ N. of 18th St.	6″ McW. 250	1-10-36	7	Cracked straight around.	Settling of ground.
13th St. 190′ W. of Meyler St. Harbor Dist.	4″ C. I.	1-16-36	16	2″ hole.	Graphitic corrosion.
Pacific Ave. 95′ N. of 7th St. Harbor Dist.	20″ C. I. B.	1-17-36	23	Vertical crack on side.	Undetermined.
Burchard Ave. 310′ S. of Cologne St.	4″ C. I.	1-17-36	12	Broken straight around.	Settling of ground.
Ridgley Dr. 946′ S. of Washington Blvd.	6″ Del.	1-18-36	11	Broken straight around.	Settling of ground.
69th St. 235′ E. of Cimarron St.	6″ Del.	1-19-36	11	Broken straight around.	Settling of ground.
Ridgley Dr. 1400′ S. of Washington Blvd.	6″ Del.	1-20-36	11	Broken straight around.	Settling of ground.
Klamath St. 289′ W. of Eastern Ave.	4″ C. I.	1-24-36	19	Broken straight around.	Settling of ground.
Glen Albyn 40′ S. of Beack St.	4″ C. I. C.	2-13-36	12	Broken straight around.	Settling of fill.
Mott St. 113′ N. of 4th St.	8″ Del.	2-14-36	1	8″ split.	Defective pipe.
Summerland Ave. Harbor Dist.	6″ Del.	2-16-36	11	Vertical crack thru top.	Weakened by connection.
Spring St. at 5th St.	6″ C. I. B.	2-17-36	38	Broken straight around.	Undetermined.
Ernest Ave. 265′ S. of Venice Blvd.	4″ C. I.	2-24-36	12	2 ft. split.	Defective pipe
39th St. at Alavon Blvd.	6″ C. I. B.	3-25-36	10	Broken straight around.	Storm drain construction.
Halm St. 69′ N. of Olin St.	4″ C. I. C.	4-11-36	12	3/8″ round hole.	Sand hole in casting.

RECORD OF BROKEN CAST IRON MAINS—(*Continued*)
MAIN AND HARBOR DISTRICTS
July 1, 1935 to June 30, 1936

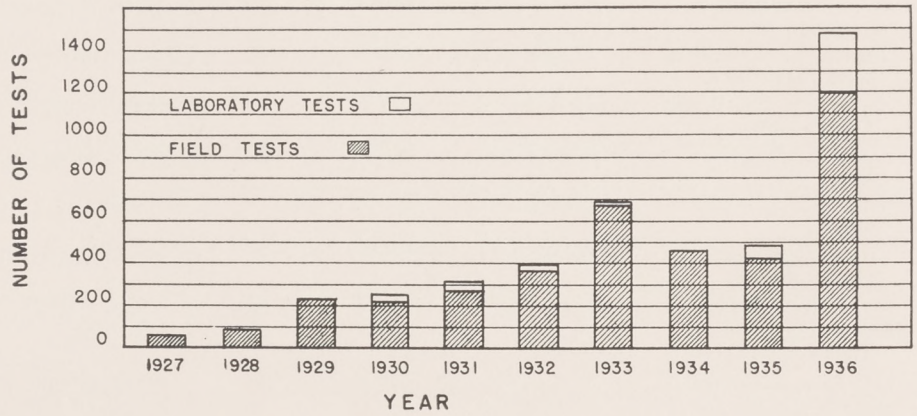
Mauretania St. at Sanford Ave. Harbor Dist.	4" C. I. B.	4-17-36	23	Broken straight around.	Oil line settled.
39th St. 210' E. of Avalon Blvd.	8" R. D. W.	4-23-36	3/12	Separated at bell.	Settled in storm drain ditch.
Mansfield Ave. 173' S. of Adams Blvd.	4" C. I.	4-27-36	Over 21	Bell broken.	Broken by clam shell.
Workman St. 242' N. of Darwin St.	4" C. I.	5- 7-36	48	Small holes.	Graphitic corrosion.
Ernest Ave. at Cologne St.	4" C. I. B.	5- 9-36	5	Broken straight around.	Sewer ditch digger.
Mansfield Ave. 230' S. of Ferndale Ave.	4" C. I.	5-20-36	Over 21	Broken straight around.	Flooding sewer ditch.
Mansfield Ave. at Westhaven Ave.	4" C. I.	5-27-36	Over 21	Broken straight around.	Flooding sewer ditch.
Beacon St. 42' S. of 14th St. Harbor Dist.	6" C. I. B.	6- 4-36	12	30" split.	Graphitic corrosion.
Q St. 104' W. of Wilmington Blvd. Harbor Dist.	6" C. I.	6-30-36	12	3 ft. split.	Graphitic corrosion.

DEPARTMENT OF WATER AND POWER
BUREAU OF WATER WORKS AND SUPPLY
STREET MAINS DIVISION — ELECTROLYSIS SECTION

TEN YEAR RECORD OF FIELD AND LABORATORY TESTS

FIELD						LABORATORY			
Fiscal Year Ending	Earth Resistivity Tests	24 Hour Recording Tests	Earth Current Tests	Bond Test Points	Special Tests	A. G. A. Tests	Indicator Sol. Tests on Paints	Chemical & Micro. Analysis	Galvanic Tests
1927	0	60	1	0	0	0	0	0	0
1928	0	90	6	0	0	0	0	0	0
1929	0	180	6	0	0	0	25	8	0
1930	0	208	0	0	0	0	0	14	0
1931	0	285	2	0	0	0	0	20	0
1932	0	366	13	0	0	0	2	12	0
1933	123	527	23	0	0	0	0	17	0
1934	9	448	13	0	0	0	0	0	0
1935	109	294	3	0	0	45	22	6	0
1936	983	199	2	4	15	224	26	3	22
AVERAGE	122.4	265.7	6.9			26.9	7.5	8.0	

GRAPH
SHOWING
FIELD & LABORATORY TESTS
BY ELECTROLYSIS SECTION



Pumping Plants and Reservoirs

FRED J. FISCHER, *Engineer*

A SUMMARY of the activities carried on by the Pumping Plants and Reservoirs Division ending June 30, 1936, is presented in the following paragraphs which have been grouped under the general headings, "Operation," "Maintenance," and "Design and Construction."

OPERATION

In Table 1 are set forth the yearly total plant outputs at each plant. These outputs total 18,993,180,000 gallons of water, of which 7,368,855,000 gallons, or 38.7 per cent., was pumped from wells, while the remaining 11,624,325,000 gallons, or 61.3 per cent., was pumped from one static level to another. The corresponding figure for the preceding year was 22,461,035,003 gallons total plant output, of which 11,696,111,746 gallons, or 52 per cent., was pumped from wells, while the remaining 10,764,923,257 gallons, or 48 per cent., was pumped from one static level to another. When the plant output totals for the fiscal year just past are compared with the corresponding figures for the preceding year, it is found that there was a 15.5 per cent. decrease.

Analysis shows a decrease of 37 per cent. in the amount of water taken from wells, and an increase of eight per cent. in water handled by step up plants. Yearly plant output for the past seventeen years is illustrated graphically in Figure 1. (See page 26.)

The average daily total plant output for the year was 52,036,000 gallons, a decrease of 9,464,000 gallons, or 15.3 per cent. over the figure for the previous year, which was 61,500,000 gallons.

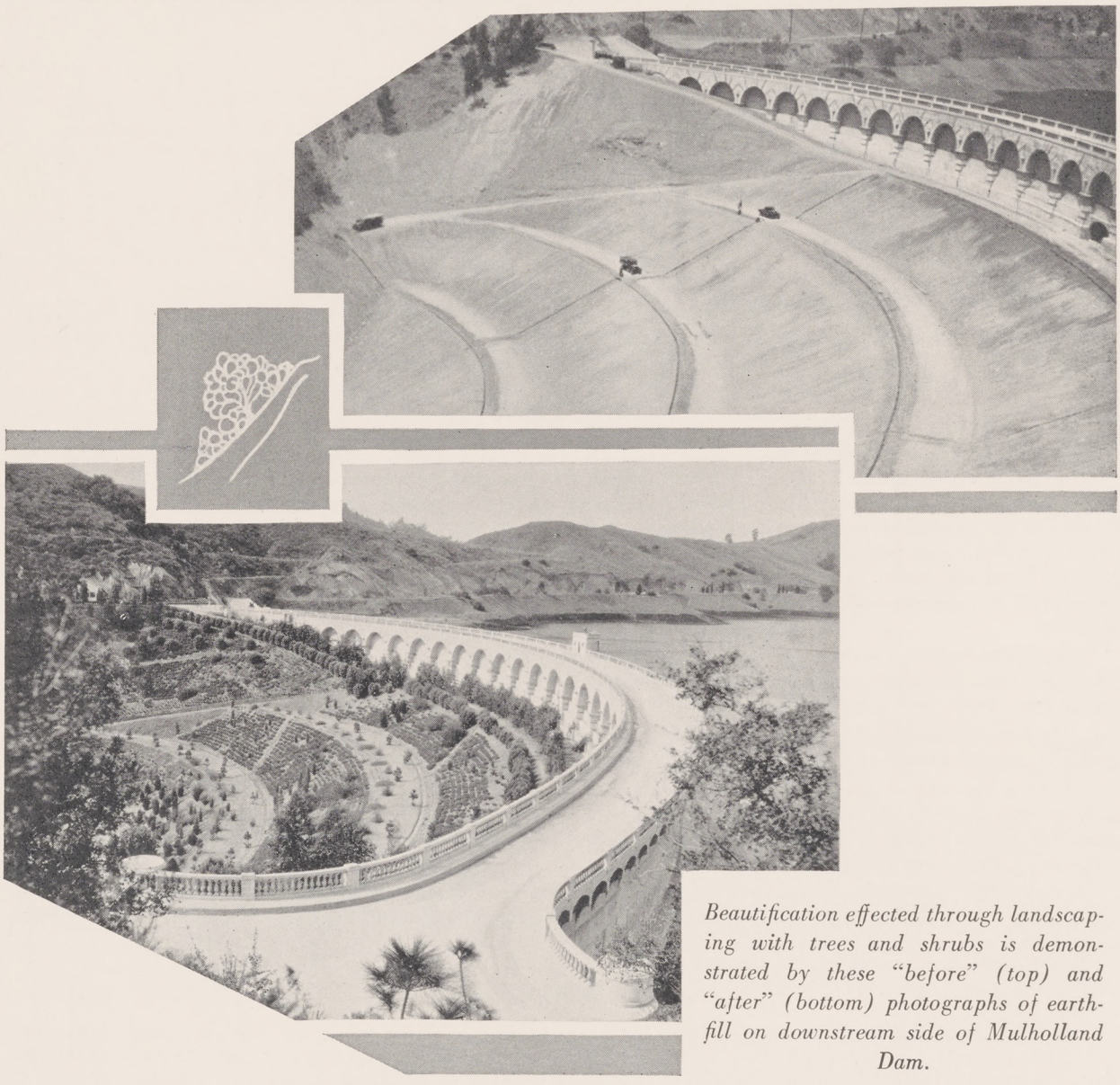
During the year studies were carried on relating to the changes which will be made necessary in pumping station equipment by the impending change in power system frequency. In making these studies particular attention has been paid to the possibility of bringing about improvements in plant operating efficiency at the time of the frequency change.

During the year sixty-two routine overload relay tests, including general inspection and adjustment of equipment, were made; and seventy-nine flow meter tests, including general overhaul and adjustment of flow meters, were made.

MAINTENANCE

In addition to the usual routine maintenance work ordinarily carried on by the Division on pumping station and reservoir properties, one large piece of maintenance work was performed, namely repairs to the San Pedro Reservoir, located at First and Meyler Streets, San Pedro. Complaints had been made by residents in the neighborhood of the reservoir that water was seeping into their basements. Test holes drilled around the reservoir showed that the ground in the neighborhood of the reservoir was saturated with water. The reservoir was emptied and a crack was found in the bottom extending the full length of the reservoir. This crack probably resulted from the earthquake of March 10, 1933. The bottom was also found to contain a great number of small cracks, as the concrete material contained no reinforcements. In order to make repairs of a permanent nature the major crack and all serious minor cracks were cut out and filled with concrete, and the bottom was then paved with two inches of flexible asphalt concrete containing only fine aggregate. In addition to the work on the bottom, all wall cracks, which were not large in number, were repaired by means of the Aquatite process. After refilling tests showed that the amount of leakage had been reduced to a very small amount.

During the year pumping units at the following plants were dismantled and completely overhauled, the work including such items as building up worn parts with hard metal by means of a metal spray process, and replacement of wearing rings: Crystal Springs Wells, Garvanza Pumping Station, Mission Wells, North Hollywood Pumping Station, and Riverside Pumping Station.



Beautification effected through landscaping with trees and shrubs is demonstrated by these "before" (top) and "after" (bottom) photographs of earthfill on downstream side of Mulholland Dam.

TABLE 1

PUMPING PLANT OPERATING DATA

PLANT	Pumped to	Period Operated	Plant Running Time in Per Cent of Year	Equipment Running Time in Per Cent of Total Equipment Hours	Gallons Pumped for Fiscal Year 1935-1936	Gallons Pumped for Fiscal Year 1934-1935	Per Cent Increase or Decrease 1935-1936 Over 1934-1935	High Day Demand in Per Cent of Plant Capacity	Quantity Energy Consumed		
									Electricity K.W. Hours	Gas Cu. Ft.	Diesel Oil Gallons
North Hollywood	715 or Hollywood Reservoir 855 or Upper Franklin Reservoir	B				[illegible]					
Pirtle Cut Well	378 or Low Gravity System	"B"				11,877,800					
Pollock Wells	378 or Low Gravity System	July to November, May and June	51.3	51.0	1,107,167,000	1,075,395,000	3.0 Increase	100.0	508,600		
Slauson	374 or Low Gravity System	"B"				"B"					
Wilmington	177 or Low Gravity System	July 1 to Oct. 22	29.0	11.7	528,300,000	1,979,930,000	73.3 Decrease	100.0	61,900	25,903,000	
	TOTALS				18,993,180,000	22,461,035,003			10,665,618	211,913,000	88,732

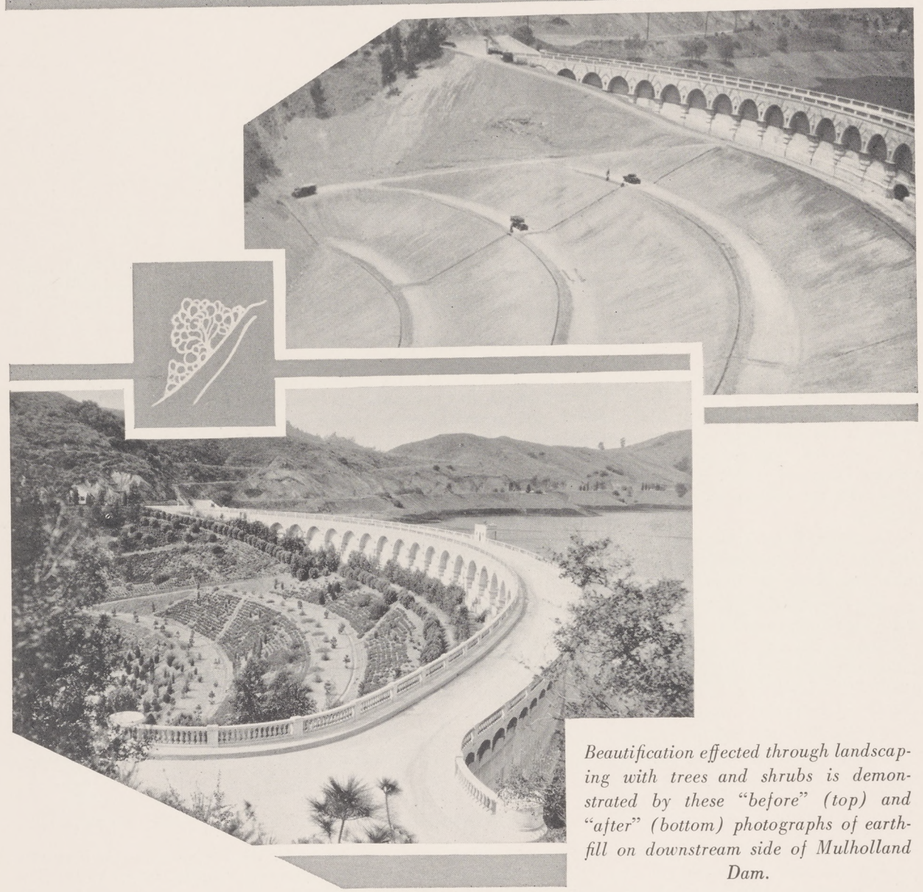
	1935-1936	1934-1935	Per Cent of Increase or Decrease Over 1934-1935
Total water handled in ground water pumping plants	7,368,855,000	11,696,111,746	37.0 Decrease
Total water handled in step-up water pumping plants	11,624,325,000	10,764,923,257	8.0 Increase
Total water handled in all water pumping plants	18,993,180,000	22,461,035,003	15.5 Decrease

ELECTRICAL ENERGY CONSUMPTION

Lankershim Generating Station ..... 4,475,500 K.W.H. Generated
Diesel Fuel Oil Consumption ..... 412,240 Gallons

Total Electrical Energy Used ..... 10,665,618 K.W.H.
Total Electrical Energy Credited as Generated ..... 3,875,755 K.W.H.
Total Electrical Energy Purchased ..... 6,789,863 K.W.H.

Key: "A" No record available
"B" Plant idle the entire year
"C" This plant placed in service November 12, 1935
"D" Pumpage estimated from K.W.H. consumption.



Beautification effected through landscaping with trees and shrubs is demonstrated by these "before" (top) and "after" (bottom) photographs of earthfill on downstream side of Mulholland Dam.

PUMPING PLANT OPERATING DATA

PLANT	Pumped to	Period Operated	Plant Running Time in Per Cent of Year	Equipment Running Time in Per Cent of Total Equipment Hours	Gallons Pumped for Fiscal Year 1935-1936	Gallons Pumped for Fiscal Year 1934-1935	Per Cent Increase or Decrease 1935-1936 Over 1934-1935	High Day Demand in Per Cent of Plant Capacity	Quantity Energy Consumed		
									Electricity K.W. Hours	Gas Cu. Ft.	Diesel Oil Gallons
STEP-UP PUMPING PLANTS											
Alpine	845	Entire Year	5.9	5.9	2,141,000	1,351,800	58.5 Increase	16.3	1,188		
Alta Vista	720 or Alta Vista Tank	Entire Year	10.2	5.1	38,594,000	27,130,000	42.2 Increase	22.4	54,460		
Ascot	733 or Bairdstown Tank	Entire Year	48.2	24.0	335,796,000	404,353,000	17.0 Decrease	37.0	272,325		
Beachwood No. 2	1143 or Innsdale Drive Tank	Entire Year	27.3	13.6	15,000,000	13,554,500	10.7 Increase	32.4	22,460		
Beachwood No. 3	1308 or Tyrolean Tank	Entire Year	3.9	1.85	1,509,000	1,493,500	1.0 Increase	20.4	2,161		
Buena Vista	618 or Solano Reservoir 618 or Ascot Reservoir High Gravity	Entire Year	100	51.6	1,159,960,000 4,079,022,000	904,593,000 3,941,537,000 185,448,000	28.2 Increase 3.4 Increase	60.3	371,800	147,054,000	
Dahlia Drive	1075	Entire Year	3.28	1.64	3,776,000	3,713,000	1.7 Increase	4.2	5,470		
Franklin	1424 or Laurel Tank	Entire Year	56.5	30.4	527,118,000	455,914,000	16.0 Increase	52.6	1,511,000		
Garvanza	922 or Eagle Rock Reservoir 746 or High Garvanza Reservoir	Entire Year	100	21.4 32.1	754,410,000 818,040,000	657,510,000 764,700,000	14.8 Increase 7.2 Increase	61.1 63.3	1,751,000		
Girard	1303 or Rosario Road Tank	Entire Year	10.6	5.38	24,148,000	6,673,200	361. Increase	39.0	38,880		
Granada No. 1	1371 or Granada Tank No. 1	Entire Year	4.5	2.28	37,066,000	28,430,623	30.5 Increase	15.2	50,400		
Granada No. 2	1615 or Granada Tank No. 2	Entire Year	1.0	.5	3,399,000	2,169,000	56.5 Increase	11.7	5,550		
Hansen Heights	1378 or Hansen Heights Tank	Entire Year	12.8	12.8	13,384,000	10,484,600	27.5 Increase	50.2	8,900		
Harbor City	266 or Harbor City Tank	Entire Year	1.36	1.36	1,251,000	2,000,000	37.5 Decrease	9.6	1,134		
Hollywood Knolls	1115 or Hollywood Knolls Reservoir	Entire Year	5.4	1.8	28,483,000	21,561,000	32.5 Increase	8.2	60,750		
Kelvin Avenue	1038 or Low Gravity System	Entire Year	"A"	"A"	"A"	"A"		"A"	28,930		
Las Palmas	720 or Las Palmas Tank	"B"									
Laurel Canyon	1096 or Woodrow Wilson Tank	Entire Year	13.3	4.4	72,129,000	68,775,000	5.0 Increase	25.2	50,200		
Maclay	1453 or Maclay High Line	"B"				48,786,000					
Mead	944 or Mead Tank	Entire Year	36.8	11.9	167,716,000	141,693,000	18.5 Increase	16.2	234,200		
Mt. Washington	936 or Mount Washington Reservoir	Entire Year	37.6	18.8	120,981,000	115,130,000	5. Increase	33.9	235,000		
Mulholland	720 or Las Palmas Tank 946 or Mulholland Drive Tank	"B" Entire Year	12.1	3.0	104,194,000	91,771,000	13.5 Increase	8.75	105,775		
Orcas	1160 or Low Gravity System	Entire Year	5.3	5.3	"A"	"A"		100.0	24,430		
Reposa	"C" 718 or Reposa Tank	November to June	"A"	"A"	"A"	"A"		"A"	248		
Riverside	771 or Edendale Tank 619 or Highland Reservoir	Entire Year	96.0 57.8	47.5 28.9	950,459,000 1,776,150,000	831,163,000 1,193,990,000	14.2 Increase 48.5 Increase	57.0 82.5	1,684,660 2,092,620		
San Pedro	400 or Summerland Reservoir 598 or Ninth Street Tank	Entire Year	51.5 12.5	25.7 6.2	516,332,000 68,404,000	453,256,600 55,979,000	14.0 Increase 12.2 Increase	54.0 29.0	651,500		
Seventh Street	488 or Boyle Heights	July 19	Less Than 1%		816,000	328,219,500	99.7 Decrease	18.0	300		
Wonderland	455 or Wonderland Tank	Entire Year	4.65	2.32	4,047,000	3,543,934	13.0 Increase	8.32	372		
GROUND WATER PUMPING PLANTS											
Barnes City	200 or Low Gravity System	"B"				"B"					
Boys' Camp Well	160	Entire Year	"A"	"A"	10,928,000	31,410,700	65.2 Decrease	81.8	11,755		
Crystal Springs Pumping Plant	378 or Low Gravity System	"B"				"B"					
Crystal Springs Wells	378 or Low Gravity System	July to November	37.5	9.8	1,327,760,000 "D"	1,832,000,000 "D"	27.6 Decrease	60.0	474,200		
Figueroa	344 or Low Gravity System	"B"				"B"					
Headworks	477 or Low Gravity System	July to March, May and June	85.5	85.5	3,203,577,000	1,857,424,046	72.5 Increase	82.0		38,956,000	
Lomita	182 or San Pedro Reservoir	July 1 to Oct. 22	31.0	15.5	521,990,000	731,340,000	28.5 Decrease	39.6			88,732
Manhattan	510 or Low Gravity System	"B"				"B"					
Mission Wells	1131 or Low Gravity System	Entire Year	94.0	57.0	669,133,000	656,734,200	2.0 Increase	88.0	343,450		
Ninety-Ninth Street	312 or Low Gravity System	"B"				"B"					
North Hollywood	715 or Hollywood Reservoir 855 or Upper Franklin Reservoir	"B"				3,520,000,000					
Pirtle Cut Well	378 or Low Gravity System	"B"				11,877,800					
Pollock Wells	378 or Low Gravity System	July to November, May and June	51.3	51.0	1,107,167,000	1,075,395,000	3.0 Increase	100.0	508,600		
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ELECTRICAL ENERGY CONSUMPTION

Lankershim Generating Station.....4,475,500 K.W.H. Generated
Diesel Fuel Oil Consumption.....412,240 Gallons

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Key: "A" No record available
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"C" This plant placed in service November 12, 1935
"D" Pumpage estimated from K.W.H. consumption.

DESIGN AND CONSTRUCTION

During the year the following important design and construction work was performed:

PUMPING PLANTS: Design and construction of a new pumping station known as "Reposa Street Pumping Station." This station is housed in a cylindrical sheet metal structure behind the curb line, and consists of a single automatically-controlled, motor-driven centrifugal pump with a capacity of 125 gallons per minute.

Installation of a Wade chlorinator at Hollywood Knolls Pumping Station under a requisition from the Sanitation Division.

Installation of a 30-inch concrete pipe inverted siphon beneath the Los Angeles River bed for conveying the water from Crystal Springs Wells No's. 44, 45, and 46 to a new pipe line which is to be installed on the south side of the river.

Installation of a cross connection and Venturi tube between the High Gravity Conduit and the Low Gravity Conduit near the River Chlorinating Station.

Design and construction of a pumping station for the Los Angeles City Fire Department on Mulholland Drive one mile east of Sepulveda Tunnel. This station consists of a single pumping unit with a capacity of 500 gallons per minute, housed in a fire-proof concrete building and arranged for control from a standard fire box located on the outer wall of the building.

RESERVOIRS: Installation of water depth recorders in Angelus Mesa and Palisades Reservoirs.

Building of road around Upper Hollywood Reservoir on a W.P.A. project.

Installation of large irrigation systems at various points around Upper and Lower Hollywood Reservoirs.

Installation of an irrigation system in Stone Canyon gardens.

Construction of Venturi tubes for the Harbor line, and installation of metering equipment and housing for same.

Removal of sub-station supplying Stone Canyon Reservoir property, which was housed in an unsightly corrugated iron building, and the installation of conduit and wiring in connection with a new sub-station installed by the Bureau of Power and Light.

MISCELLANEOUS: Layout and installation of electric welding circuits in Ducommun Street blacksmith shop building.

Relocation of machine tools in Ducommun Machine Shop, and installation of a new switchboard and conduits for serving same. This work was performed under a requisition from the General Plant Division.

Installation of 300 feet of cyclone fencing on the east boundary of the Franklin Reservoir property.

MONO CRATERS TUNNEL PROJECT: Layout, purchase, and supervision of installation of pumping equipment for tunnel unwatering purposes.

Design and construction of six special tunnel unwatering pumps of large capacity and of a new type.

Layout, purchase, and supervision of installation of aftercoolers in all major compressor stations.

Design and construction of concrete placing equipment including special cars for haulage of concrete materials.

Layout, purchase, and supervision of installation of two large size centrifugal compressors for Shaft 3.

Layout, design, and construction of a large number of miscellaneous items of equipment for the project.

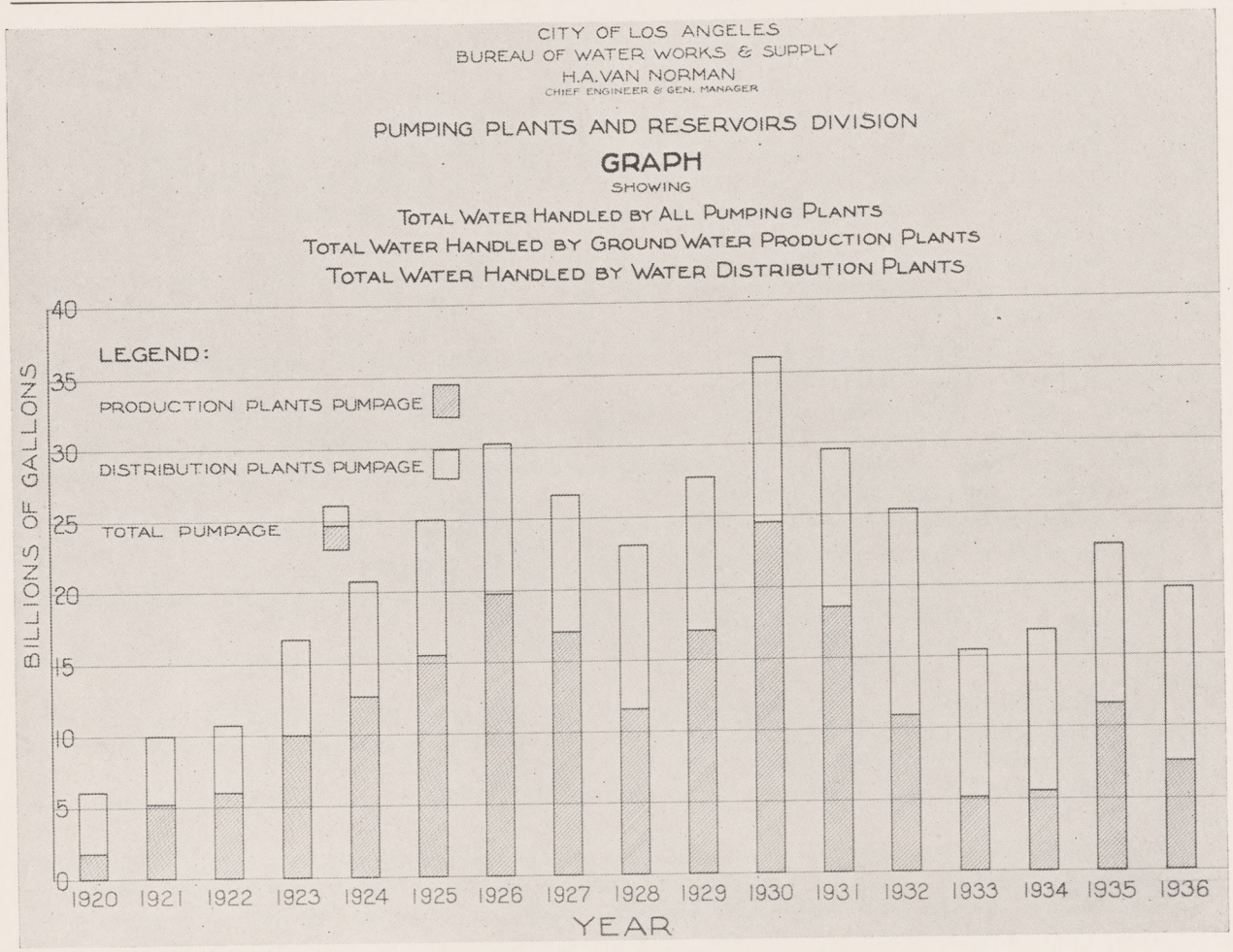
W.P.A. PROJECTS: Preliminary layout work was begun on various W.P.A. projects during the year.

CARPENTER SHOP: Scale models of various hydraulic structures such as gate towers, spillways, transitions, etc. were constructed under requisition from the Field Engineering Division.

DRAFTING: During the year 128 design and layout drawings were completed, sixty-eight of which pertained to the Mono Craters Tunnel Project, and the remainder of which pertained to the work of the Pumping Plants and Reservoirs Division.

During the year sixty-two authorizations to perform various kinds of work, involving an estimated expenditure of approximately $48,750, were obtained by this Division, as compared to sixty-six authorizations, involving an expenditure of approximately $40,000 for the preceding year. This works out to a decrease of 7 per cent. in the number of authorizations, and an increase of 12.2 per cent. in the estimated expenditures. In addition to the above, fifty-four authorizations were obtained for work on the Mono Craters Tunnel Project, involving an estimated expenditure of $132,250.

A total of 3370 material requisitions were issued during the year, as against 3347 for the previous year, an increase of .7 per cent.


CITY OF LOS ANGELES
BUREAU OF WATER WORKS & SUPPLY
H.A. VAN NORMAN
CHIEF ENGINEER & GEN. MANAGER
PUMPING PLANTS AND RESERVOIRS DIVISION
GRAPH
SHOWING
TOTAL WATER HANDLED BY ALL PUMPING PLANTS
TOTAL WATER HANDLED BY GROUND WATER PRODUCTION PLANTS
TOTAL WATER HANDLED BY WATER DISTRIBUTION PLANTS
LEGEND:
PRODUCTION PLANTS PUMPAGE
DISTRIBUTION PLANTS PUMPAGE
TOTAL PUMPAGE
BILLIONS OF GALLONS
0
5
10
15
20
25
30
35
40
1920
1921
1922
1923
1924
1925
1926
1927
1928
1929
1930
1931
1932
1933
1934
1935
1936
YEAR

Ground Water Surveys and Development

D. A. LANE, *Assistant Engineer*

DEVELOPMENT

NO extensive ground water development projects were undertaken during the year. Two crews have assisted in laying a new emergency pumping line in the vicinity of Crystal Springs. The old gallery above Verdugo Wash was endangered by the excavating of material in the Los Angeles River bottom by the U. S. Engineer Department. This pipe laying work extended into June and consisted of approximately 3,860 feet of 24-inch and 30-inch concrete pipe and appurtenances.

Several tower footings were drilled at stations along the Boulder Canyon Transmission Line for the Bureau of Power and Light. At Shaft No. 1 on the Mono Craters tunnel 12-inch and 16-inch wells were drilled to assist in dewatering the formation.

At Ascot Reservoir a total of 4,716 feet of hole was drilled for grouting. These holes took 3,222 sacks of cement in the grouting operations, or an average of 52 sacks per hole. Other holes were drilled at San Pedro Reservoir to serve as test holes; six holes were drilled to an average depth of 70 feet.

One crew was used throughout the year to remove weeds and fire hazard material from Water Bureau owned non-operative property as requested by the Right-of-Way and Land Division.

The regular required maintenance at the Tujunga Spreading Grounds was carried on and surveys of the water spreading possibilities at Hot Creek in Long Valley were made.

Preliminary engineering work was carried on in connection with the Mono Craters tunnel and also with P.W.A. projects in San Fernando Valley.

UNDERGROUND WATERS OF THE SOUTH COASTAL PLAIN

Routine measurements have been made during the year on a large number of wells throughout this area. Groundwater fluctuation is based on the measurement of key wells selected as typical in the area, with careful consideration given to their not being affected by local conditions due to the change of seasonal lag in the rise of the water table. The observations on which the annual change is based is the time the well reached its maximum elevation during the season.

A summary of these measurements in the coastal area covered by this Division indicates that there has been an average drop of 1.7 feet during the 1935-1936 season. To facilitate the study of this coastal area, it is divided into three primary basins from which, by further designation of local areas, an indication of the water table fluctuation may be described in fairly close detail.

INGLEWOOD - SAN PEDRO BASIN

This basin includes the coastal cities of El Segundo, Manhattan, Hermosa and Redondo, and the interior cities of Inglewood, Hawthorne, Gardena and Torrance, as well as a portion of the Los Angeles Harbor area. Roughly, it is bounded on the south by the Palos Verdes Hills, on the east by the Dominguez Hills, and on the north by the Baldwin Hills. At the present time the entire area is dependent upon local groundwater, with the exception of the Los Angeles Harbor area, into which, during the past year, the Bureau of Water Works and Supply has imported Owens River Aqueduct water by means of the harbor trunk line.

The importation has relieved the draft on both the Lomita and Wilmington Pumping plants as is clearly shown by a rise in the wells in the immediate vicinity of these plants. Torrance is the only member city of the Metropolitan Water District within this basin.

INGLEWOOD DISTRICT

Notwithstanding that they are widely separated, the four key wells in this area had an identical drop for the year 1935-36 of 1.10 feet. The water table in the district varies from 2.66 to 5.30 feet below sea level.

HAWTHORNE-LENNOX DISTRICT

All wells have dropped during the season, varying from 1.05 to 2.05 feet, with an average of 1.45 feet. On the long record key well there has been a total drop of 32.15 feet during the past 14 years, or an average

of 2.30 feet per year as compared with 2.05 feet during the past year. The ground water surface is all below sea level varying from 2.15 feet to 8.04 feet.

PALISADES DEL REY DISTRICT

Two key wells in this area have dropped from 0.25 to 0.60 foot, with an average of 0.42 foot.

It would appear paradoxical that the well with the least drop is located at the coast, with a water table slightly above sea level, while the interior well has a maximum drop, with a water table slightly below sea level.

EL SEGUNDO DISTRICT

Due to continuous pumping for industrial use in the immediate vicinity of the coast, the key wells used are a short distance inland.

There has been a slight drop during the year of all key wells ranging from 0.25 to 1.00 foot with an average of 0.62 foot. The water table elevation varies from 5.40 feet below to 6.04 feet above sea level.

REDONDO-EL NIDO DISTRICT

Due to the almost constant operation of producing wells it has been impossible to obtain an adequate record along the shore line. The average of seven key wells in this area, the nearest of which is approximately 4,000 feet from the beach line, have all dropped during the past season an average of 1.26 feet. This drop has been from 0.50 foot to 1.50 feet. The water table in this entire area is below sea level, with an average of approximately ten feet.

TORRANCE DISTRICT

Fluctuation has varied from a gain of 1.00 foot to a loss of 1.70 feet. The well showing the loss is located in the center of the oil drilling field and may be purely a local condition. The Water Bureau well drilled during 1932 has shown a constant drop until this year. This year it has indicated a rise of 1.00 foot. Due to the cessation of pumping in the vicinity of this well, it may be taken as indicative of the true trend of the water table in this area. All key wells have a water table of from 18.9 to 21.1 feet below sea level.

MONETA-STRAWBERRY PARK DISTRICT

The average of 7 key wells in this district indicate a drop of 1.11 feet for the 1935-36 season. This *is a variation from no change* to a maximum drop of 1.70 feet. One well, with a 26 year record has dropped a total of 27.80 feet or 1.45 feet per year average, as compared with this year's drop of 1.30 feet.

All wells have a water table below sea level, varying from 9.56 to 12.74 feet.

GARDENA DISTRICT

There has been a drop in the water table on all wells in this area during the past season averaging 12.3 feet, which had varied from 0.75 to 2.10 feet. All wells are below sea level, with a minimum of 8.32 feet to a maximum of 10.32 feet.

LOMITA AND HARBOR CITY DISTRICT

Five wells in this area indicated a drop averaging 1.01 feet and five other wells had a rise averaging 1.63 feet. The drop has varied from 0.35 foot to 1.70 feet, and the rise from 0.15 foot to a maximum of 2.35 feet. A considerable portion of the rise is possibly due to the discontinuance of pumping by the Bureau at the Lomita Pumping Plant. The water table of the wells in this district is all below sea level varying from 12.07 feet to a maximum of 23.37 feet.

WILMINGTON DISTRICT

All wells in this district during the past season have risen from 0.75 feet to 2.00 feet with an average of 1.37 feet, as compared with an average drop last year of 1.20 feet. This rise is due to the cessation of pumping at the Wilmington Plant by the Bureau of Water Works and Supply.

The key well, with a record of thirteen years, has shown a total drop of 24.80 feet, averaging 1.91 feet per year, as compared with this past season's rise of 2.00 feet.

SOUTH COASTAL BASIN

The portion of this basin under observation by the Los Angeles Water Bureau consists of that area lying west of the Rio Hondo from Montebello to the coast. Within the above described portion of the South Coastal Basin are the principal groundwater diversions of the Water Bureau, exclusive of the San Fernando Valley.

LOS ANGELES DISTRICT

Located within the area, considered by this Division as the Los Angeles District, are the pumping plants of the Water Bureau, commonly known as Figueroa Street, Compton and Slauson, Manhattan and Green Meadows. None of these plants were operated during the fiscal year, and with the exception of one month's operation during 1932 at the Compton and the Figueroa Street plants, there has been no pumping since September of 1931.

The water table of the Los Angeles District, which may roughly be considered as that area bounded by Exposition Boulevard, Compton Avenue, Century Boulevard and West Avenue, has continued to drop. The ten key wells have dropped an average of 2.12 feet, which has varied from 0.95 foot to a maximum of 3.50 feet.

At the Figueroa Street Pumping Plant, notwithstanding the complete discontinuance of operation, there has been a drop of 2.55 feet as compared with 2.05 feet for the previous year. The key well mentioned in last year's report, located in the vicinity of Manchester and Vermont Avenue has dropped 1.35 feet as compared with 0.95 foot for the previous year. The 25 year average for this well has been 2.06 feet per year.

EAST LOS ANGELES DISTRICT

That portion of this area, which is primarily industrial west of the Los Angeles River from Ninth Street to Vernon City limits and adjacent to Santa Fe Avenue, has indicated an average drop of 3.62 feet as compared with an average drop of 0.28 foot for last year.

The industrial area East of the Los Angeles River, along 26th Street to Atlantic Boulevard, has shown an average drop of 2.78 feet, varying from 1.15 feet to a maximum of 3.75 feet as compared with an average drop of 1.68 feet for last year. This is apparently due to the increase in industrial consumption.

In the City of Vernon industrial area along Santa Fe Avenue, there has also been an increased drop averaging 1.55 feet as compared with 1.15 feet for the previous year.

BANDINI-LAGUNA DISTRICT

The four key wells of this district have shown an average drop of 3.84 feet which has been from 3.15 feet to 4.55 feet. Last year there was an average rise of 0.04 foot.

DOWNEY DISTRICT

The lowering of the wells in this area has almost doubled this year as compared with the previous season. This year the drop has been from 2.15 feet to 2.40 feet, with an average of 2.25 feet. The average last year for the same key wells was 1.05 feet.

MAYWOOD DISTRICT

There has been an average drop of three key wells of 4.83 feet as compared with a rise for the same period last year of 0.58 foot.

WATTS DISTRICT

This district has three key wells, with a maximum of 3.20 feet, a minimum of 1.60 feet and an average drop of 2.23 feet for the season.

The average for last fiscal year was a drop of 1.32 feet.

LYNWOOD DISTRICT

All key wells in this district have dropped from 1.35 feet to a maximum of 3.24 feet, with an average of 2.41 feet. For the 1934-35 season there was an average drop of only 0.72 foot.

COMPTON DISTRICT

The wells under observation in this district have lowered an average of 3.95 feet during the past year as compared with an average of 0.93 foot for the previous season. This year's drop has varied from a minimum of 2.05 feet to a maximum of 7.60 feet. The maximum drop is on a well located almost in the central business district of the City of Compton.

The key well mentioned in last year's report as having a rise of 1.15 feet during the 1934-35 season, notwithstanding continuous drop during the previous twelve years, this year had a drop of 3.05 feet. In 1923 this well was flowing approximately two feet above ground level, and the peak elevation during the year 1936 was 34.45 feet below the ground surface.

CLEARWATER DISTRICT

The average drop of key wells in this vicinity has been 4.87 feet as compared with a seasonal average for last year of 0.05 foot. This year's drop has varied from 4.05 feet to 6.05 feet.

LOS ANGELES RIVER BELOW DOMINGUEZ

There has been a lowering of the water table in this entire area during the past year which has varied from 1.14 feet to 4.30 feet, with an average of 2.29 feet. There was a rise in the water table over this area during the two previous seasons. In this vicinity the water table varies from 2.65 feet above sea level in the vicinity of the Dominguez Gap to 11.74 feet below sea level in the vicinity of Bangle Station.

WEST COASTAL BASIN

This basin consists of the area lying between the Santa Monica Mountains and Baldwin Hills, westerly from Crenshaw Boulevard to the Pacific Ocean.

ANGELES MESA DISTRICT

The Water Bureau well in this area, which has not been pumped, had a drop of 3.10 feet during the 1935-36 season as compared with a drop of 0.05 foot for the 1934-35 season. There has been a total drop of 43.80 feet in the water level in this well since 1925, or an average of 3.98 feet per year for the eleven year period.

CULVER CITY DISTRICT
(Below Gap)

All key wells in this district have shown a drop varying from 0.45 foot to 1.10 feet, with an average of 0.86 foot. Last year some of these wells indicated a rise, although the average for the area was a lowering of 1.51 feet.

STEPHENS CANYON DISTRICT

As stated in previous reports the behavior of the ground water in this area is particularly interesting due to the concentration of pumping at the lower end of the basin by the City of Santa Monica and a private water company. All wells have shown a drop with the average for the basin being 4.55 feet. A private key well in the immediate vicinity of the concentrated pumping has shown a drop of 6.35 feet during the past season with an average of 5.01 feet drop per year for the past six years.

VENICE DISTRICT

All wells in this district have indicated a drop during the past season, with the exception of one which has had a rise of 0.25 foot. The drop has been from 0.25 foot to 1.35 feet with an average (taking the rise into consideration) of 0.58 foot.

UNDERGROUND WATER—SAN FERNANDO VALLEY

Ground water surveys in the San Fernando Valley have been continued throughout the past year. The season's rainfall has been below normal with over sixty per cent of the total precipitation falling during the month of February. This uneven distribution of rainfall has influenced the percolation rate into the soils of the groundwater basins as expressed in percentage of run-off and recharge.

The flood control dams in the Pacoima and Big Tujunga Canyons have impounded less water this year than they did during the previous season and, consequently, the reservoirs have not contributed as much water to the stream channels below the dams. This deficiency in recharge is noticeable in that portion of the valley most directly affected. It is interesting to note that the difference in the amounts of water spread at Tujunga spreading grounds is very nearly equal to the difference in the quantities of water pumped from the Vanowen wells for the years 1934-35 and 1935-36; that is, the yearly mean pumpage for 1934-35 was approximately 15 second feet as compared with no pumpage for 1935-36. The excess of water spread in 1934-35 over that for 1935-36 would represent a mean yearly flow of about 14 second feet.

In the Sunland basin the water surfaces in all wells have dropped with the exception of one well. This is in rather sharp contrast with the previous season in which only two wells showed a drop in the water surface. The average drop for the 1935-36 season has been 2.22 feet. The minimum being 0.68 foot and the maximum 5.22 feet.

Water surfaces in the measured wells of the Big Tujunga Valley above Stonehurst Avenue have dropped from 0.37 foot to 6.51 feet, giving an average for the area of —3.67 feet as compared with a rise of more than a foot for the previous season.

Well measurements in the area above San Fernando indicate an average drop in the water table of 3.6 feet, while in the sub-basin to the northwest there is shown an average rise of 1.09 feet.

The Mission Wells, operated by the Bureau have produced an average flow of 2.78 second feet for the year. The Vanowen Wells were not pumped at any time during the 1935-36 season.

In the area north of Van Nuys the water table for 1935-36 year is 1.32 feet higher than for the previous year as indicated by the average rise of the wells in that area. Factors contributing to this gain in stage are probably the contribution to the groundwater basin from the Tujunga spreading grounds and the Pacoima and Tujunga drainage areas together with the non-operation of the Vanowen Wells. A beneficial result of water-spreading is evidenced, in the area between Van Nuys and Burbank, by a higher water table. The wells in this area indicate a rise of over two feet as compared with a drop of 0.6 foot for the previous year. However, there has been a noticeable subsidence of the water table in the Glendale district and also in the vicinity of the Bureau's Headworks Plant. A maximum drop of 3.43 feet was observed between the water table elevation of June 1935 and June 1936. Likewise, at the Narrows the water table showed a drop; the elevation this year being approximately a foot lower than for last year in June. In this connection it should be noted that combined production at the Headworks and Crystal Springs plants was nearly the same for the two years.

In the western portion of the valley the sixty-six measured wells indicate an average rise of 0.34 foot. Thirty-four of these wells show an average rise of 1.80 feet and the other thirty-two show a drop of 1.18 feet. The water table between Van Nuys Boulevard and Reseda Avenue, generally, is at a higher elevation, and that west of Zelzah and southwest of Canoga Park is lower for the present year than was the case a year ago.

There were eighteen private wells pumped for irrigation use during the year in the western part of the valley. The power demand on eight of these wells was sixteen per cent greater than the power demand for the same wells for the year 1934-35.

LOS ANGELES RIVER

The average diversion from the Los Angeles river sources in the Griffith Park area was 63.5 second feet as compared with 61.0 second feet during the year 1934-35.

Above the Griffith Park diversions, the Los Angeles river surface flow at Buena Vista Street was 18.43 second feet for the month of June 1936 as compared with 19.28 second feet for the corresponding period in 1935.

No Owens River Aqueduct water was diverted into the Los Angeles River through the River Power Plant during the year.

HEADWORKS

The Headworks Pumping Plant was in operation throughout the year with the exception of 19 days in February and March, and 34 days in April and May of 1936.

CRYSTAL SPRINGS

The Crystal Springs Gallery and wells were operated to meet the seasonal requirements as far as available supplies would permit. The gallery wells were shut down November 17, 1935, and their operation was not again resumed until June 11, 1936.

SAN FERNANDO VALLEY IRRIGATION

During the calendar year 1935 there was net acreage planted of 45,709 acres with a second and intercrop acreage of 3,464 acres, giving a total of 49,173 rotated crop acres.

This acreage consisted of the following principal crops:

Crop	Acres	Revenue	Duty	Ac. Ft.	Per Cent of Total
Alfalfa	6,025	$ 69,205.60	1.76	10,598	16.7
Asparagus	611	6,459.58	1.62	989	1.6
Beans	5,307	32,235.43	.93	4,937	7.8
Sugar Beets	1,207	8,538.33	1.08	1,308	2.1
Citrus	10,260	106,807.43	1.59	16,356	25.7
Deciduous	960	2,888.27	.47	442	0.7
Figs	253	1,619.75	.98	248	0.4
Grapes	545	1,514.28	.43	232	0.4
Olives	545	1,749.15	.49	268	0.4
Roses and flowers	671	8,378.49	1.91	1,283	2.0
Walnut	7,062	36,127.56	.78	5,533	8.7
Misc. Truck	15,727	138,537.05	1.35	21,215	33.5
1935 Total Rotated	49,173	$414,060.92	1.29	63,409	100 %
1934 Total Rotated	49,718	$420,307.61	1.29	64,366	

The average depth of water for the net area irrigated was 1.39 acre feet as compared with 1.42 feet for the previous year. It will be noted that the rotated duty or use of water was identical with that of 1934 or 1.29 feet.

The figures for the calendar year 1935 are used due to the fact that the heaviest irrigation of the majority of the crops and considerable new planting is taking place at the close of the fiscal year and it would be impossible to accurately segregate the various acreages and duties as of June 30th.

Due to the light rainfall of 2.21 inches the irrigation demand for the period July to December, inclusive of the 1935 season, was very heavy, being seventeen per cent above normal for the same period during the three previous years.

Bean acreage with a planting of 7,500 acres for the 1936 season shows an increase of 2,200 acres above 1935, but is still about fifty per cent below the average planting for the years 1925-1931, inclusive.

Sugar beets, with a planting of 1,000 acres for 1936 season, show a decrease of 200 acres from the 1935 season.

The asparagus acreage for 1936 has increased by about 250 acres of new planting which brings the total asparagus acreage in the valley up to approximately 1,000 acres.

Alfalfa acreage is increasing slightly this year. While some old fields are being plowed under considerable new area is being planted.

The total acreage of the various truck crops remain about the same as previous years, although small parcels of mixed truck crops are steadily increasing.

There still continues to be about 200 to 250 acres of new citrus being planted each year. Notwithstanding the removal of old citrus trees each year, the increase is very steady.

Walnuts and deciduous trees continue to show a decrease from year to year due principally to subdividing.

As a result of the dry conditions of the soil in January 1936 and the allowance of half rate for irrigation water during February and March, the irrigation demand was quite heavy, being 6,537 acre feet as compared with 552 acre feet for 1935 and 1,669 acre feet for 1934 for the same three months period.

The total average rainfall for the season 1935-36 from fifteen stations located throughout the valley was 12.03 inches compared with 18.69 inches for the 1934-35 season.

The average monthly rainfall in inches for the fifteen stations observed during 1935-36 was as follows:

July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
0.03	0.12	0.06	0.20	1.16	0.64	0.42	7.42	1.38	0.58	0.00	0.02

WATER SPREADING

In the San Fernando Valley

At the Tujunga Spreading Grounds operations of the 1934-35 season were carried over to July 14th. During the period of July 1st to July 14th, a total of 757.0 acre feet of Owens River water was placed under ground.

Spreading for the 1935-36 season began on October 22nd and continued through to May 8th, a total of 196 days. There were some test basins operating up to June 30, 1936, but these basins were only spreading a small quantity of water.

A fairly uniform and efficient rate of percolation was obtained until the month of February during which month the unit rate of percolation dropped to 4.58 acre feet per acre. This decrease of about 1.5 acre feet from any previous month of the season, and the lowest rate ever noted for any single month, was due to several factors. The principal factor was that the works were operating almost to capacity, which necessitated the use of unfinished basins in poor spreading ground and with a roughness which prohibited harrowing. The rainfall of 6.30 inches during the month hampered the harrowing of basins and thus necessitated their use for longer periods of time than demanded for efficient operation.

The following summary table for the season 1935-36 shows quite clearly that, notwithstanding the low seasonal average of 5.52 acre feet per acre and the low rate of 4.58 acre feet per acre for the month of February, the drop in percolation is not due to any permanent sealing effect of the spreading area.

TUJUNGA SPREADING GROUNDS

SUMMARY OF SPREADING SEASON 1935-1936

Month	No. Days Spread	Net Ac. Cov. Per Day	Average Ac. Ft. Spread	Average Ac. Ft. per Ac.	Ac. Ft. Spread per Mo.	Mean Flow C.F.S.	Air Temp.	Water Temp.	Evap. Ac. Ft.
July	14	6.27	54.1	8.63	757.0	12.3	71°	74°	1.58
Aug.	----	----	----	----	----	----	76°	----	----
Sept.	----	----	----	----	----	----	67°	----	----
Oct.	10	15.00	99.2	6.61	992.3	16.1	61°	No Rec.	2.41
Nov.	29	9.42	56.7	6.02	1644.7	27.6	56°	51°	1.99
Dec.	29.66	7.95	50.6	6.36	1500.4	24.4	52°	47°	1.58
Jan.	30.32	10.71	64.4	6.01	1952.2	31.7	53°	46°	2.40
Feb.	29	41.85	191.7	4.58	5559.2	96.6	52°	49°	6.46
Mar.	31	28.95	145.4	5.02	4507.7	73.3	55°	55°	9.87
April	30	11.44	80.5	7.04	2416.1	40.6	59°	58°	4.20
May	7	11.03	79.6	7.22	557.2	9.1	65°	62°	1.39
June	----	----	----	----	----	----	----	----	----

Total number days spread during season	210
Acreage covered (net total)	3603.51
Average net area covered per day (acres)	17.16
Total acre feet spread for season	19,886.80
Average acre feet spread daily	94.70
Average rate of percolation for season (acre feet per acre)	5.52
Total evaporation from water surface during season (acre feet)	31.88

NOTE: Run 8,407,000 cu. ft. or 193.0 ac. ft. in test basins 'C' 9-10 from May 8th to June 12th, 1936. This amount not considered in spreading datum.

NOTE: Test basins were operated from May 8th to June 12th, spreading a total of 193.0 acre feet. This amount is not included in above spreading table.

MISCELLANEOUS

Observations of dam seepage, rainfall and temperature, and evaporation losses were made and recorded as in past years.

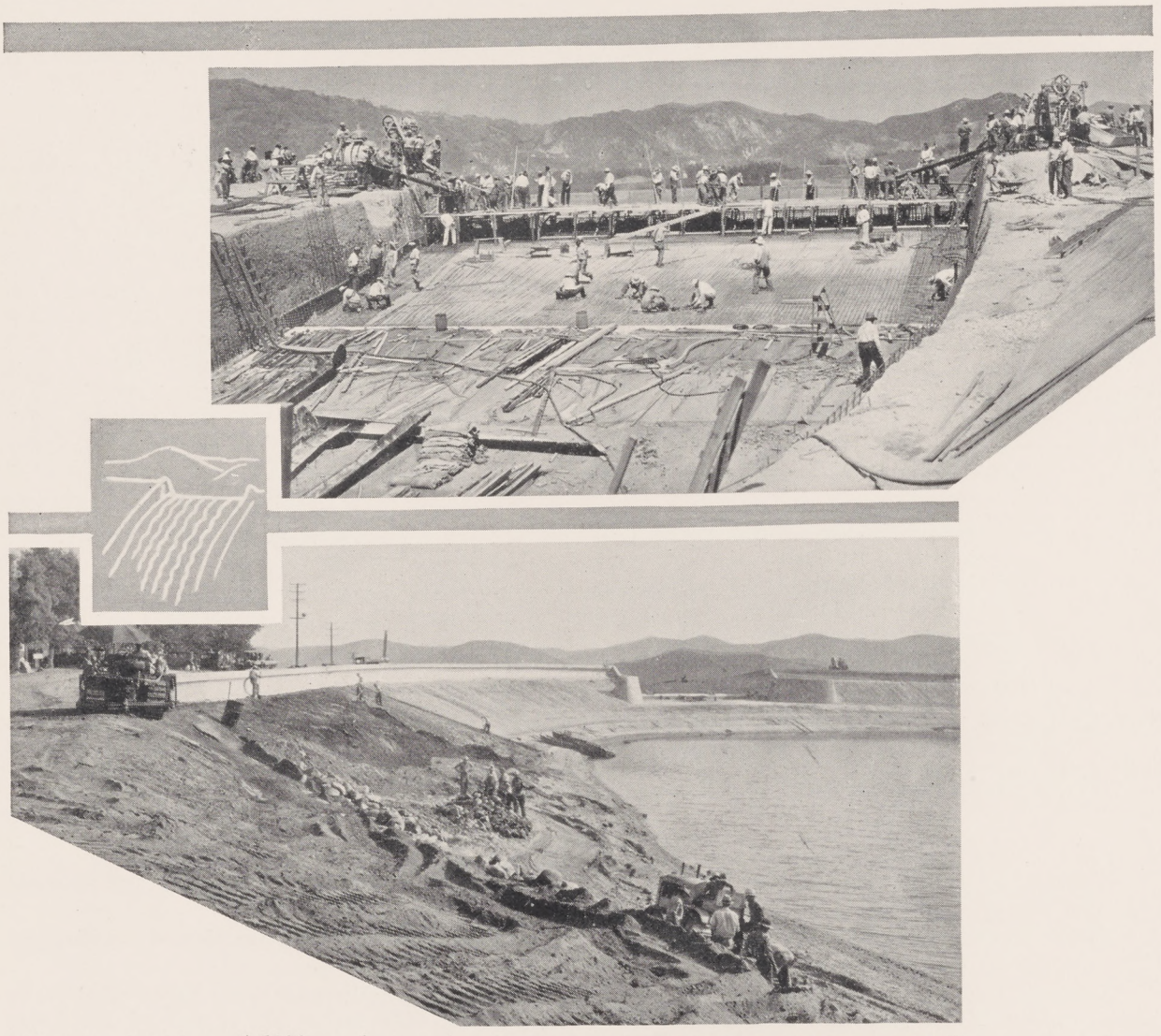
Water supply and consumption records and reports were prepared as a regular function of the division. These records are commented upon in the report of the Engineer of Waterworks.

Beginning in June, data was collected to be used in preparing court exhibits for water rights litigation in the Los Angeles River. This work is being carried on in cooperation with, and at the request of, the Legal Division. Office and field work in connection with transmission line litigation was also done at the request of the Power Bureau.

This Division has cooperated with other governmental agencies so as to eliminate a multiplicity of observations, by the different agencies, leading to the same result. Cooperative work has been carried on with the United States Department of Agriculture, Bureau of Agricultural Engineering; the United States Geological Survey, the California Department of Public Works, Division of Water Resources, and the Los Angeles County Flood Control District.

During the period covered in this report the United States Engineer Department has carried on a flood control project in the Los Angeles river bed and the Verdugo Canyon. This work has resulted in straightening these channels both in grade and alignment throughout the project. All of this work in the river channel has been done in the vicinity of and upstream from the Crystal Springs works of the Bureau. Water flowing in this reconstructed channel will undoubtedly attain a higher velocity than water at the same stage in the old channel, thus a greater scouring action in the bed of the river is to be expected during periods of storm run-off in the immediate future. It is entirely possible that the depth of scour may be great enough to endanger the Bureau's collecting line in the river bottom and it was the anticipation of such a condition which led to the construction of the 24-inch and 30-inch pumping line referred to under "Development."

The lowering of the stream channel in the vicinity of Crystal Springs may cause an addition to the surface flow of the river and a decrease of the groundwater storage basin, resulting in a waste of water unless means are provided below Crystal Springs to conserve the flow.



Construction views of 5100-sec. ft. capacity spillway, Upper San Fernando Reservoir.

San Fernando Valley Distribution System

JOHN H. BOUEY, *Superintendent District Distribution*

DURING the fiscal year ending June 30, 1936, a new concrete spillway, designed for a capacity of 5100 second feet, was constructed at the Upper San Fernando Reservoir as a State Emergency Relief Administration project. In conjunction with the spillway a parapet wall, bridge to outlet tower, wing walls (2), face slab and slab extension, bridge, piers, and boathouse were constructed. The following tabulation of the major elements comprising this construction indicates the approximate quantities necessary.

Excavation	Concrete	Lumber (for forms)	Reinforcing Steel
34,250 cu. yds.	3,186 cu. yds.	93,500 bd. ft.	186 tons

A 214,700 gal. welded steel tank was erected east of Topango Canyon Road, 4000 feet southerly from Mulholland Highway, to more adequately serve that portion of Girard and adjacent territory above the 1000 ft. elevation. This site necessitated an excavation of approximately 1700 cu. yds. dirt preparatory to tank erection. To prevent corrosion of the bottom plates, an oil sand cushion was placed between these plates and the earth foundation.

The grounds around the Bouquet Canyon and Chatsworth Hi-Line caretaker's residences were landscaped, and trees, shrubbery and lawn planted at both locations.

During the fiscal year 27.76 miles of pipe, four inches in diameter and larger, was installed in the San Fernando Valley; 9.56 miles abandoned, 4.94 miles removed and .76 miles lowered.

Thirteen VandeVenter fire hydrants were installed.

Service activities were as follows:

Total services installed	1861
Total services disconnected	84
Total meters installed	2249
Total meters removed	311

Meters and Services

GEORGE READ, *Superintendent*

THE following report shows the activities of the Meter and Service Division for the fiscal year ending June 30, 1936 covering all districts.

WATER METERS IN SERVICE

DOMESTIC, COMBINATION, AND DETECTOR CHECK VALVE BY-PASS METERS	June 30 1936	June 30 1935	Increase or Decrease
5/8-inch	78,394	78,673	279 *
5/8x3/4-inch	117,156	114,776	2,380
3/4-inch	2,112	2,122	10 *
3/4x1-inch	31,600	29,168	2,432
1 -inch	15,561	14,900	661
1½-inch	6,291	6,162	129
2 -inch	3,616	3,511	105
3 -inch	640	625	15
4 -inch	440	432	8
6 -inch	114	110	4
8 -inch	6	6	----
10 -inch	3	3	----
TOTAL	255,933	250,488	5,445
IRRIGATION METERS			
1½-inch	27	17	10
2 -inch	354	344	10
3 -inch	1,073	1,036	37
4 -inch	1,896	1,879	17
6 -inch	214	210	4
8 -inch	2	2	----
TOTAL	3,566	3,488	78
GRAND TOTAL	259,499	253,976	5,523

* Decrease.

METERS NOT OPERATING

EXCLUSIVE OF IRRIGATION

Meters in Service		Meters Not Operating		Percentage Taken Out
July 1, 1935	250,488	July 1935	745	0.297
Aug. 1, 1935	250,888	Aug. 1935	703	0.280
Sept. 1, 1935	251,264	Sept. 1935	601	0.239
Oct. 1, 1935	251,534	Oct. 1935	568	0.226
Nov. 1, 1935	251,851	Nov. 1935	453	0.180
Dec. 1, 1935	252,403	Dec. 1935	521	0.206
Jan. 1, 1936	252,660	Jan. 1936	588	0.233
Feb. 1, 1936	253,037	Feb. 1936	524	0.207
Mar. 1, 1936	253,411	Mar. 1936	539	0.213
Apr. 1, 1936	254,012	Apr. 1936	479	0.189
May 1, 1936	254,549	May 1936	507	0.199
June 1, 1936	255,248	June 1936	589	0.231
Average	252,612		568	0.225

Meters removed for not operating:			
On account of damage by hot water	3613		
For other causes	3204		
TOTAL meters removed for not operating		6817	
Meters removed for minor repairs		5582	
TOTAL meters changed			12,399
Meters removed on account of no immediate use			1,642
TOTAL meters brought to Meter Shop			14,041
Per cent of non-operating meters due to damage by hot water			53%
Number of meters changed from straight reading to round dial type register			31
Number of meters changed from open type to oil enclosed gear train			2594

METER SHOP EXPENSE

REPAIRING METERS

Sizes	Total No. of Meters In Service	Total No. of Meters Repaired	Total Charges	Direct Supervision and Clerical	Repair Labor	Misc. Meter Labor	Janitor Labor	Material	Transportation	Miscellaneous	Material Handling Expenses
5/8 and 5/8x3/4"	195,550	11,213	$45,177.67	$5,144.94	$6,266.21	$6,961.37	$ 822.13	$20,850.81	$ 660.15	$2,065.60	$2,406.46
3/4 and 3/4x1"	33,712	1,548	5,472.31	715.19	871.05	967.68	114.28	2,174.27	91.77	287.13	250.94
1"	15,561	504	2,656.40	312.27	380.33	422.52	49.90	1,188.74	40.07	125.37	137.20
1½"	6,318	270	2,728.18	314.56	383.12	425.62	50.26	1,244.36	40.36	126.29	143.61
2"	3,970	233	3,233.96	348.84	424.86	471.99	55.74	1,566.88	44.76	140.05	180.84
3"	1,713	306	2,535.28	276.48	336.73	374.09	44.18	1,216.89	35.47	111.00	140.44
4"	2,336	633	3,938.10	458.23	555.66	617.30	72.90	1,787.95	88.54	183.17	206.35
6"	328	272	1,048.97	175.94	214.29	238.06	28.21	268.27	22.58	70.65	30.97
8"	8	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
10"	3	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
	259,499	14,979	$66,790.87	$7,744.45	$9,432.25	$10,478.63	$1,237.60	$30,298.17	$993.70	$3,109.26	$3,496.81

TESTING METERS

	No. Tested						
	18,857	4,250.88	1,375.55	1,675.33		1,200.00	
Total	18,857	4,250.88	1,375.55	1,675.33		1,200.00	

METER SHOP EXPENSE—*Continued*

FIELD EXPENSE—REMOVING, CHANGING AND REPAIRING METERS

	29,463.63		22,714.08			1,026.83	5,531.36		191.36
Total	29,463.63		22,714.08			1,026.83	5,531.36		191.36
GRAND TOTAL	$100,505.38	$9,120.00	$33,821.66	$10,478.63	$1,237.60	$31,325.00	$6,525.06	$4,309.26	$3,688.17

UNIT COST SHOP MAINTENANCE FOR METERS REPAIRED

Sizes	Total No. of Meters Repaired	Total Charges	Direct Supervision and Clerical	Repair Labor	Misc. Meter Labor	Janitor Labor	Material	Transportation	Miscellaneous	Material Handling Expenses
5/8 and 5/8x3/4"	11,213	$4.029	$ .459	$ .559	$ .620	$ .073	$1.860	$ .059	$ .184	$ .215
3/4 and 3/4x1"	1,548	3.535	.462	.563	.625	.074	1.405	.059	.185	.162
1"	504	5.271	.620	.755	.838	.099	2.359	.079	.249	.272
1½"	270	10.104	1.165	1.419	1.576	.186	4.609	.149	.468	.532
2"	233	13.879	1.497	1.823	2.026	.239	6.725	.192	.601	.776
3"	306	8.285	.904	1.100	1.222	.144	3.977	.116	.363	.459
4"	633	6.221	.721	.878	.975	.115	2.825	.092	.289	.326
6"	272	3.857	.647	.788	.875	.104	.986	.083	.260	.114
8"	0	-----	-----	-----	-----	-----	-----	-----	-----	-----
10"	0	-----	-----	-----	-----	-----	-----	-----	-----	-----
	14,979	4.459	.517	.630	.699	.083	2.023	.068	.208	.233

UNIT COST SHOP MAINTENANCE FOR METERS TESTED

	No. Tested								
	18,857	.225	.073	.089				.063	
	18,857	.225	.073	.089				.063	
Average Cost per Meter Repaired to Total Expense		6.710	.609	2.258	.700	.083	2.091	.435	.288	.246

UNIT COST SHOP MAINTENANCE FOR METERS IN SERVICE

Sizes	Total No. of Meters In Service	Total Charges	Direct Supervision and Clerical	Repair Labor	Misc. Meter Labor	Janitor Labor	Material	Transportation	Miscellaneous	Material Handling Expenses
5/8 and 5/8x3/4"	195,550	$ .231	$ .026	$ .032	$ .036	$ .004	$ .107	$ .003	$ .011	$ .012
3/4 and 3/4x1"	33,712	.162	.021	.026	.029	.003	.064	.003	.009	.007
1"	15,561	.170	.020	.024	.027	.003	.076	.003	.008	.009
1½"	6,318	.432	.050	.081	.087	.008	.197	.006	.020	.023
2"	3,970	.815	.088	.107	.119	.014	.395	.011	.035	.046
3"	1,713	1.480	.161	.197	.218	.026	.710	.021	.065	.082
4"	2,336	1.685	.195	.238	.265	.031	.765	.025	.078	.088
6"	328	3.198	.536	.653	.726	.026	.818	.069	.216	.094
8"	8	-----	-----	-----	-----	-----	-----	-----	-----	-----
10"	3	-----	-----	-----	-----	-----	-----	-----	-----	-----
	259,499	.257	.030	.036	.040	.005	.117	.004	.012	.013
Average Cost per Meter in System to Total Expense		.387	.035	.130	.040	.005	.121	.025	.017	.014

WATER SERVICE CONNECTIONS & METERS—ALL DISTRICTS

JUNE 30, 1936

ACTIVE SERVICE CONNECTIONS AND METERS:	SERVICES	METERS
Domestic, turned on, metered	245,815	245,871
Automatic Sprinkler, on	1,740	1,659
Sewer, City	5,880	.....
Sewer, County	54	.....
Combination	5,887	5,887
Temporary, metered	312	327
Temporary, unmetered, flat rate	171	.....
TOTAL ACTIVE, Exclusive of Irrigation	259,859	253,744
INACTIVE SERVICE CONNECTIONS AND METERS:		
Domestic, shut off, meters in	2,109	2,109
Domestic, shut off, meters out	17,434	.....
Automatic Sprinkler, off	156	80
Sewer, off	4,182	.....
1911 Act	25,416	.....
Vacant Lot (unpaid)	15,829	.....
Disconnected (temporarily)	4,150	.....
TOTAL INACTIVE, Exclusive of Irrigation	69,276	2,189
TOTAL ACTIVE AND INACTIVE Service Connections, Exclusive of Irrigation	329,135	255,933
INTERMITTENT IRRIGATION SERVICES AND METERS:		
Meters in, turned on	3,565	3,566
Meters out, shut off	302	.....
Disconnected	76	.....
TOTAL IRRIGATION Services and Meters	3,943	3,566
TOTAL SERVICE CONNECTIONS AND METERS IN SYSTEM	333,078	259,499
STUB SERVICE CONNECTIONS	4,427	.....
GRAND TOTAL	337,505	.....

NOTES: Where the number of meters exceeds the number of service connections, it is due to two or more meters on one service connection. The above meter total includes 1739 By-Pass Meters on Detector Check Valves governing Automatic Sprinkler service for fire protection.

Service connections in use supplying sewer flushing through flush tanks are equipped with Jet Meters, and at this date there are 5,880 Jet Meters in use.

WATER SERVICE CONNECTIONS IN SYSTEM—ALL CLASSES

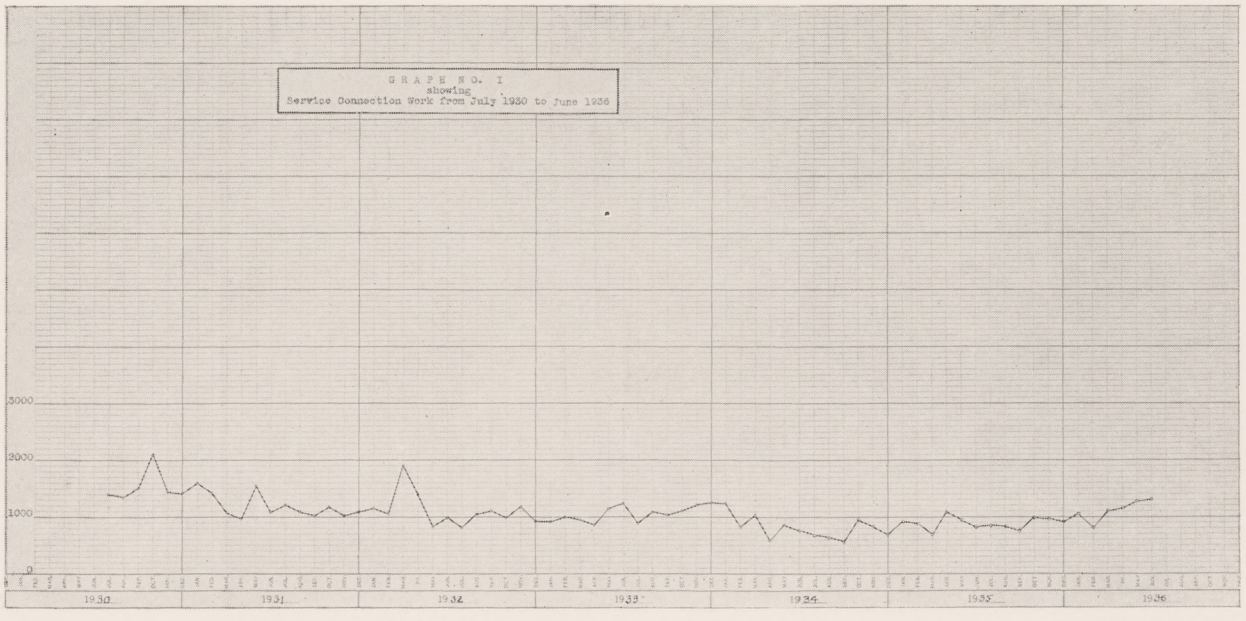
	JUNE 30,1936	JUNE 30, 1935	INCREASE
Los Angeles District	264,633	263,489	1,144
Harbor District	20,489	20,345	144
West Los Angeles	22,256	21,560	696
San Fernando Valley	30,022	28,214	1,808
Aqueduct District	105	.....	105 *
TOTAL	337,505	333,608	3,897

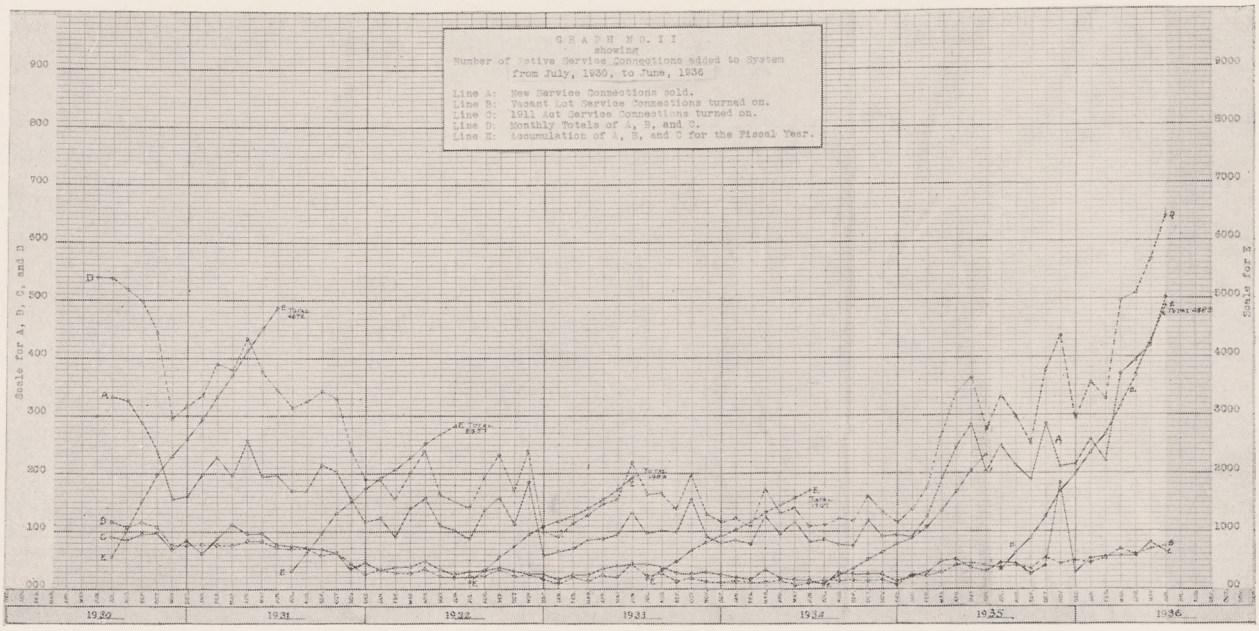
*Aqueduct District service connections previously included in totals for Los Angeles District. All Aqueduct service connections are assigned temporary service numbers.

SERVICE CONNECTION WORK—ALL DISTRICTS
FISCAL YEAR—1935-1936

Month	Domestic	Sewer	Fire	Combination	Irrigation	Vacant Lot	Stub	Temporary	Enlargements	Renewals	Disconnections	Totals
1935												
July	248	2	....	25	6	....	17	20	16	431	79	844
August	213	....	3	26	3	1	31	11	15	464	68	835
September	189	42	....	13	1	2	....	6	16	402	78	749
October	284	....	3	16	2	2	....	17	24	524	122	994
November	211	....	2	7	1	2	....	8	14	533	199	977
December	215	2	....	8	2	6	28	20	18	522	90	909
1936												
January	258	1	1	13	8	2	2	26	20	594	128	1,053
February	221	2	3	14	6	....	....	15	17	433	98	809
March	371	2	3	27	12	1	....	27	27	487	143	1,100
April	393	1	4	27	15	1	1	24	23	506	167	1,162
May	419	8	....	28	15	4	....	70	23	581	131	1,279
June	502	....	3	25	15	1	2	108	19	422	206	1,303
TOTAL	3,524	60	22	229	86	22	81	352	230	5,899	1,509	12,014

(See Graph No. 1)




GRAPH NO. II
showing
Number of Active Service Connections added to System
from July, 1930, to June, 1936
Line A: New Service Connections sold.
Line B: Vacant Lot Service Connections turned on.
Line C: 1911 Act Service Connections turned on.
Line D: Monthly Totals of A, B, and C.
Line E: Accumulation of A, B, and C for the Fiscal Year.
Scale for A, B, C, and D
Scale for E
1930
1931
1932
1933
1934
1935
1936

GRAPH NO. II

EXPLANATION

A—Represents number of new Domestic and Commercial service connections ordered installed.

B—Represents number of Vacant Lot service connections already installed for which turn-on orders were received. The installation charges for these connections are collected at the time the turn-on is ordered.

C—Represents 1911 Act service connections for which turn-on orders were received, installation charges already paid.

D—Shows totals of the items in A, B and C for the corresponding month, and hence shows total new business by months.

E—Is the accumulation of items in D, and hence shows the growth of new business by months.

The service connections turned on as represented by lines B and C are connections that were installed in advance of use to prevent future cutting into the street pavement.

SEWER FLUSHING SERVICE

FISCAL YEAR 1935-1936

	Los Angeles	San Pedro	San Fernando Valley	West Los Angeles	Total
Service Connections turned on	33	14	7	21	75
Service Connections shut off and sealed	12	13	2	3	30
Inactive Service Connections Inspected	2,897	101	114	480	3,592
Jet Meters Installed	10	14	7	21	52
Jet Meters Cleaned	8,282	941	394	788	10,405
Total Inspections	11,234	1,083	524	1,313	14,154

Total Sewer Service Inspections	Labor	Material	Wire Jet Meters	Transportation	Indirect Charges	Total Charges	Avg. Cost per Inspection
14,154	$5,660.62	$73.13	$37.75	$1,560.44	$2,481.76	$9,813.70	$0.693

Total Service Charge on Active Flush Tank Service Connections during year	@ 25c each	$17,598.25
Cost of 14,154 Inspections	$9,813.70	
Cost of Removing 277 Sewer Service Connections	5,523.15	
Total Sewer Service Maintenance Cost		$15,336.85

OPERATION OF METER & SERVICE FIELD & METER REPAIR SHOP FORCES—ALL DISTRICTS

SERVICE CONNECTIONS—All Sizes:

Installed—including stubs	4,376
Enlarged	230
Renewed: Acct. of Paving	117
New Mains	1,508
Leaks	4,274
Retapped	329
Disconnected	1,509
Acquired	56

METERS:

Set	7,167
Changed	12,399
Removed	1,631
Repaired in Shop	13,916
Tested in Shop	19,148
Location Changed	310
Register Glasses Renewed	16,182
Dials Cleaned	2,970

DETECTOR CHECK VALVES INSTALLED:	26

LEAKS REPAIRED:

Mains	1,259
Services	1,475
Meters	6,986
Fire Hydrants	947
Consumer's Pipes	183

CEMENT WORK:

No. 2 Meter Boxes and Covers Installed	1,146
No. 3 Meter Boxes and Covers Installed	171
No. 4 Meter Boxes and Covers Installed	40
No. 5 Meter Boxes and Covers Installed	10
Sidewalk Repairs	214
Fire Hydrants Cemented Around	219
Detector Check Valve Pits and Covers Installed	22
Meter Boxes Repaired	1,828

MISCELLANEOUS OPERATIONS:

Turn Ons	27,688
Shut Offs	20,747
Covered Reads	4,557
Closing Reads	18,125
Detector Check-Valve By-Pass Meters Read	7,196

(Continued on page 42)

OPERATION OF METER & SERVICE FIELD & METER REPAIR SHOP FORCES—ALL DISTRICTS—*Continued*

Meter Box Centerpieces Replaced	2,820	
Meter Boxes Raised, Lowered and Cleaned	10,499	
Holes Around Meter Boxes Filled	2,540	
Connecting Consumer's Pipes	503	
No. 1 Meter Boxes Set	4,017	
Inspections:		
Construction Water	3,564	
Meter Boxes	15,197	
Automatic Sprinkler Services	556	
Ditches	55,022	
Leaks	2,815	
Sealed Services	58,927	
Damaged Meters	2,447	
See if OK, Stuck, or Vacant	5,144	
Pressure Regulators	271	
Broken Seals	281	
Combination Rate	5,968	
Special	4,121	
General	6,863	
Sounding for Leaks:		
Service Connection	16,727	
Fire Hydrants	-----	
Service Connections Cut	19	
Pavement Cuts	2,639	
Flushing Mains	3,323	
Hauling Dirt, Filling Lanterns, etc.	5,791	
		389,025
FLUSH TANK OPERATIONS:		
Turn Ons	75	
Shut Offs	30	
Inactive Meter Inspections	3,592	
Jet Meters Installed	52	
Jet Meters Cleaned	10,154	
		14,154
SAN FERNANDO VALLEY IRRIGATION OPERATIONS:		
Turn Ons	32,197	
Gear Trains Set	3,685	
Check Readings Taken	158,519	
		194,401
GRAND TOTAL OF OPERATIONS		597,580

BILLS COLLECTIBLE REPORT—Fiscal Year 1935-1936

Class of Bill	Los Angeles		Harbor		West Los Angeles		San Fernando Valley		TOTAL	
	No.	Amount	No.	Amount	No.	Amount	No.	Amount	No.	Amount
Burned and Damaged Meters	349	1,412.65	70	273.36	6	22.53	15	58.52	440	1,767.06
Service Installations	51	11,649.29	11	1,995.10	5	681.93	91	9,996.28	158	24,322.60
Temporary Service Installations	50	1,918.97	3	243.78	6	133.00	22	931.07	81	3,228.82
Street Main Assessment	12	639.88	8	248.00	5	877.88	63	4,800.55	86	6,566.31
Meter and Service Location Change		----------	----	----------	1	113.98	6	248.86	7	362.84
Moving Pictures	4	42.66	----	----------	1	28.13	10	416.46	15	487.25
Meter Installations	2	364.10	2	313.31	----	----------	2	519.00	6	1,196.41
Service Enlargements	1	12.00	----	----------	1	18.00	2	87.29	4	117.29
Misc., including Sewer Service Renewals, Outlet Gate Inst. Extens., Meter Rentals, etc.	21	1,213.42	6	186.40	2	26.12	24	513.64	53	1,939.58
Total Number of Bills and Total Amount Billed	490	$17,252.97	98	$3,259.95	27	$1901.57	235	$17,571.67	850	$39,986.16

CONSTRUCTION WATER BILLS REPORT

FISCAL YEAR 1935-1936

District	Number Bills	Amount Billed
Los Angeles	99	$2,460.84
West Los Angeles	35	547.35
Harbor	18	182.47
San Fernando Valley	51	1,019.92
TOTAL	203	$4,210.58

NOTE: The above "Bills Collectible Report" and "Construction Water Bills Report" represent bills made by the Meter and Service Division, which are forwarded to the Commercial Division for collection.

REPORT SHOWING

CONSUMPTION OF WATER ESTIMATED TO BE USED FROM FIRE HYDRANTS FOR EXTINGUISHING FIRES, FIRE HYDRANT MAINTENANCE, AND WATER USED FOR FLUSHING SEWERS AND FLUSH TANK SERVICE CHARGES; AND WATER USED FOR FLUSHING CULVERTS, CATCH-BASINS, STORM DRAINS AND STREETS, AND FOR WATERING TREES

FISCAL YEAR 1935-1936

Class of Service	Estimated Consumption Cubic Feet	Water Revenue	Service and Estimated Maintenance Charges	Total
CITY OF LOS ANGELES:				
Fire Hydrants	521,431,900	$366,442.50	$366,442.50	$732,885.00
Flush Tanks and Manholes	84,918,900	42,459.45	17,699.80	60,159.25
Street Flushing and Washing	12,648,400	6,324.20	.....	6,324.20
Culvert and Catch-Basin Flushing	2,316,200	1,158.10	.....	1,158.10
Tree Watering	236,600	118.30	.....	118.30
TOTAL—CITY	621,552,000	$416,502.55	$384,142.30	$800,644.85
COUNTY OF LOS ANGELES:				
Fire Hydrants	1,363,500	2,727.00	1,363.50	4,090.50
Flush Manholes	409,900	887.40	.....	887.40
Flushing from Hydrants	26,500	53.00	.....	53.00
TOTAL—COUNTY	1,799,900	$ 3,667.40	$ 1,363.50	$ 5,030.90
U. S. GOVERNMENT:				
Fire Hydrants	13,200	$ 18.00	$ 18.00	$ 36.00
TOTAL—U. S. GOVERNMENT	13,200	$ 18.00	$ 18.00	$ 36.00
GRAND TOTAL	623,365,100	$420,187.95	$385,523.80	$805,711.75

Water Distribution and Design

D. E. ROCKFELLOW, *Engineer*

A SUMMARY of work performed by the Water Distribution and Design Division for the fiscal year 1935-1936 is submitted herewith.

The Water Distribution and Design Division comprises a number of sections of which the following are the more important: Distribution System Studies and Design; Structural Design; Drafting and Engineering Computations; and Records and Statistics.

PUBLIC WORKS ADMINISTRATION PROJECTS

During the past fiscal year, considerable time was devoted to preliminary plans and estimates in connection with work for which application was made for approval by the Public Works Administration. All work performed under Public Works Administration regulations carries with it an outright grant of forty-five per cent of the total estimated cost. The Bureau of Water Works and Supply is taking this opportunity to further improve its entire system and at the same time cooperate with the Federal Administration in alleviating unemployment in the city.

In October, 1935, the Public Works Administration approved projects submitted by the Bureau of Water Works and Supply totaling $4,878,000. Of this amount, over four million dollars will be expended in improving the water distribution system.

DISTRIBUTION SYSTEM STUDIES AND DESIGN

Preliminary plans, estimates and specifications were prepared for widespread improvements of the distribution system in accordance with the Public Works Administration application. These improvements include new trunk lines; minor mains and services; pumping plants; steel tanks; reservoir outlet works and appurtenant structures; and sanitary protection of reservoirs.

The largest unit for which plans and estimates were prepared is the Stone Canyon-Western Avenue trunk line with an estimated cost of $1,127,000. This line, when completed, will provide service for certain areas in the West Coast and Lennox districts, and in addition will increase the pressure in the southern part of the city and will provide at all times ample supply for the Harbor district.

Upon completion of Public Works Administration units, now planned, the rating of the water distribution system should be raised to a marked degree. This rating is established by the National Board of Fire Underwriters who conduct surveys of the water supply at regular intervals.

Studies were made for supply and distribution systems in the Venice, Palms and Mar Vista areas, in the Lennox area, and for other smaller areas not served by the Bureau.

Problems in supply and betterment of the distribution system in the main City district, San Fernando Valley district and Harbor district were investigated and studied.

STRUCTURAL DESIGN

Plans, specifications and cost estimates were prepared for concrete reservoirs, steel tanks, buildings, alterations of buildings, and minor structures, both in the city and along the aqueduct. Studies and investigations were made in reference to improvement of various structures and reports submitted.

Included among the structures investigated or designed and for which plans, specifications and material lists were prepared are the following:

TANKS, RESERVOIRS AND PUMPING PLANT BUILDINGS DESIGNED

Topanga Canyon steel tank; Lomita Drive bolted steel tank; Mulholland Highway pumping plant; York Boulevard pumping plant; Mead reservoir and appurtenant structures; and reinforced concrete tanks.

WAREHOUSES AND OTHER BUILDINGS DESIGNED

Independence machine shop warehouse and garage; Mojave warehouse; five-room standard residence for Los Angeles Aqueduct; service station at Mojave yard; sand blasting and enameling plant at Slauson and Compton yard; alterations to building at Second and Rose Streets for photographic section, unused elevator shaft in Hill Street building, and seventh floor of Broadway building.

Miscellaneous Structures Designed

Steel reinforcements for Water Canyon flume; overhead crossing of Tuttle Creek; beam sets, Mono Craters Tunnel; Red Rock Shaft, Jawbone Division; Parshall measuring flumes and Venturi meters; Imhoff sewer tank; gravel separating bin; Ivanhoe Tunnel and appurtenances; and Upper San Fernando Tower Bridge.

DRAFTING AND COMPUTATIONS

Numerous drawings and tracings were made of structures designed for the Mono Basin Project, such as tunnels, shafts, camps, conduits, dams, and spillways. In addition, drawings were made for the soil laboratory, for the Meter and Service Division, for Los Angeles Aqueduct structures and for projects approved by the Public Works Administration. Charts, graphs and reports were also maintained showing the progress of excavation work on Mono Basin tunnels and shafts.

Other maps included those for the Yandell condemnation, the Arcularius right of way, the Clover suits, and land classification maps showing areas in Lone Pine township, Long Valley, and property south of Long Valley dam site. Work on topographic maps included plotting and profiling of the conduit line from Grant Lake to Mono Craters Tunnel.

Filing maps and field notes were prepared for Haiwee Reservoir, Tinemaha Reservoir and Silver Springs pipe line in Bouquet Canyon. Maps and applications were revised and amended for water rights filing.

Plans and profiles were prepared of the Los Angeles River water system from the Headworks galleries to Buena Vista Reservoir, for the proposed 30-inch pipe line on Fletcher Drive and the Harbor Trunk Line.

Computations consisted of hydraulic properties for Mono Basin conduits and tunnels; planimetering and calculating of tunnel cross sections; ties to triangulation and section corners; road and pipe line traverses; earth excavation and concrete yardage; area and capacity curves; and acreage assessments.

Triangulation work was continued along the Los Angeles River channel in cooperation with the City Engineer's Office and the Los Angeles Flood Control District. A triangulation network was planned and maps prepared for an area along the aqueduct from Bouquet Canyon to Haiwee Reservoir and computations were completed for Crystal Springs, Chatsworth and other Department properties. The Mono Craters Tunnel length was checked by single triangles; an adjustment was made of precise levels for the Mono Craters Tunnel; and a simultaneous adjustment was made of the entire system controlling the Mono Craters Tunnel.

A unit cost study was prepared of Bouquet Canyon Reservoir and appurtenant structures showing the cost of earth work, concrete work, tunnels and pipe lines. Cost data was also compiled for completed structures at Upper San Fernando Reservoir, Hollywood Reservoir and other improvement work in the distribution system.

RECORDS AND STATISTICS

Extensive records were prepared of all pipe, gates, fire hydrants, and appurtenances either installed, removed or abandoned during the fiscal year and tabulations were brought up to date showing the status of the system at the end of the fiscal year. This data has been classified for the separate districts as well as for the distribution system as a whole. The cast iron pipe summary which first appeared in the report of the previous fiscal year has been continued.

Valuable information has been recorded from new tract maps, street name changes and other statistical data necessary in keeping district maps up to date. The district maps, which cover the entire distribution system, show all water mains, gates and fire hydrants as well as consumers water service connections.

MISCELLANEOUS

Miscellaneous work includes that of indexing of maps and drawings, photostatic reproduction, and photography. The photostatic and photographic section has recently moved to new and larger quarters at Second and Rose Streets where they are equipped to turn out a larger volume of work. Rectigraph work during the fiscal year totaled 70,300 square feet.

RECORDS OF DISTRIBUTION SYSTEM
FISCAL YEAR 1935-1936

The following is a summary of the record work performed by the Drafting Division:

1.	Street main extension orders checked	536 +
2.	Foreman's pipe reports platted on district sheets and recorded	697 +
3.	New service installation locations given	1,790 +
4.	New services platted on district sheets	3,844 +
5.	Service change installations platted	8,423 —
6.	Street name changes platted	331 +

7.	Fire hydrant locations checked	87 —
8.	New tract maps received and recorded	124 +
9.	New tract maps platted on district sheets	43 +
10.	New district tracings replacing old tracings	37 —
11.	Miscellaneous searching for protecting our rights in quitclaims and court cases	231 —
12.	Plans completed and sent to City Engineer	2 —
13.	Street improvement plans received from City Engineer and checked for substructure interference	161 +
14.	Jobs reported complete and reported to City Engineer	10 —
15.	Rectigraph work (estimated square feet)	70,302 +

NOTE: + is increase or — decrease of work over previous year.

ACQUIRED WATER MAINS
FISCAL YEAR 1935-1936

0.880 miles of mains located in the Shoestring Addition now being served by this Bureau were acquired from the City of Torrance.

1.002 miles of mains were acquired from The Boulevard Land Co. in the Girard high area.

3.552 miles of mains laid by contract, under the Street Improvement Act of 1911, in the Shoestring Addition and leased to the City of Torrance were returned to the distribution system.

GATES

Size	In System June 30, 1935	Installed	Removed	Acquired	Net Change	In System June 30, 1936
			MAIN CITY DISTRICT			
4″	11,364	109	111	.....	— 2	11,362
5″	29	.....	.....	.....	.....	29
6″	18,947	247	28	.....	+219	19,166
7″	11	.....	.....	.....	.....	11
8″	4,695	120	5	.....	+115	4,810
10″	282	.....	.....	.....	.....	282
12″	1,343	7	.....	.....	+ 7	1,350
14″	10	.....	.....	.....	.....	10
16″	124	1	.....	.....	+ 1	125
18″	31	.....	.....	.....	.....	31
20″	200	.....	1	.....	— 1	199
22″	2	.....	.....	.....	.....	2
24″	118	8	.....	.....	+ 8	126
26″	4	.....	.....	.....	.....	4
28″	0	1	.....	.....	+ 1	1
30″	35	.....	1	.....	— 1	34
36″	12	.....	.....	.....	.....	12
TOTAL	37,207	493	146	.....	+347	37,554
			HARBOR DISTRICT			
4″	521	21	.....	11	+ 32	553
5″	1	.....	.....	.....	.....	1
6″	2,200	15	.....	2	+ 17	2,217
8″	292	13	.....	.....	+ 13	305
10″	49	.....	.....	.....	.....	49
12″	73	3	.....	.....	+ 3	76
16″	28	5	.....	.....	+ 5	33
18″	7	.....	.....	.....	.....	7
20″	2	.....	.....	.....	.....	2
22″	1	.....	.....	.....	.....	1
24″	0	7	.....	.....	+ 7	7
TOTAL	3,174	64	.....	13	+ 77	3,251

GATES

SAN FERNANDO VALLEY DISTRICT

4″	6,076	75	113	.....	— 38	6,038
6″	4,834	262	86	.....	+176	5,010
8″	1,146	106	11	.....	+ 95	1,241
10″	5	.....	.....	.....	.....	5
12″	453	30	2	.....	+ 28	481
14″	9	.....	.....	.....	.....	9
16″	23	.....	.....	.....	.....	23
18″	14	.....	.....	.....	.....	14
20″	9	.....	.....	.....	.....	9
22″	4	.....	.....	.....	.....	4
24″	27	.....	.....	.....	.....	27
26″	1	.....	.....	.....	.....	1
30″	7	.....	.....	.....	.....	7
36″	15	1	.....	.....	+ 1	16
48″	5	.....	.....	.....	.....	5
54″	1	.....	.....	.....	.....	1
TOTAL	12,629	474	212	.....	+262	12,891

GATE SUMMARY

District	In System June 30, 1935	Installed	Acquired	Removed	Net Change	In System June 30, 1936
Main City	37,207	493	.....	146	+347	37,554
Harbor	3,174	89	.....	12	+ 77	3,251
San Fernando	12,629	474	.....	212	+262	12,891
TOTAL	53,010	1,056	.....	370	+686	53,696

ALTITUDE VALVE SUMMARY

District	In System June 30, 1935	Net Increase During Year	In System June 30, 1936
Main City	20	0	20
Harbor	3	0	3
San Fernando	4	0	4
TOTAL	27	0	27

VENTURI METER SUMMARY

District	In System June 30, 1935	Net Increase During Year	In System June 30, 1936
Los Angeles	26	1	27
Harbor	4	1	5
San Fernando	16	..	16
TOTAL	46	2	48

FIRE HYDRANT REPORT

JUNE 30, 1936

LOS ANGELES CITY

2½" Single	12,583
2½" Double	158
2½"x4" Double	1,417
4" Double	1,834
	15,992

HARBOR DISTRICT

2½" Single	936
2½" Double	25
2½"x4" Double	108
4" Double	148
	1,217

SAN FERNANDO DISTRICT

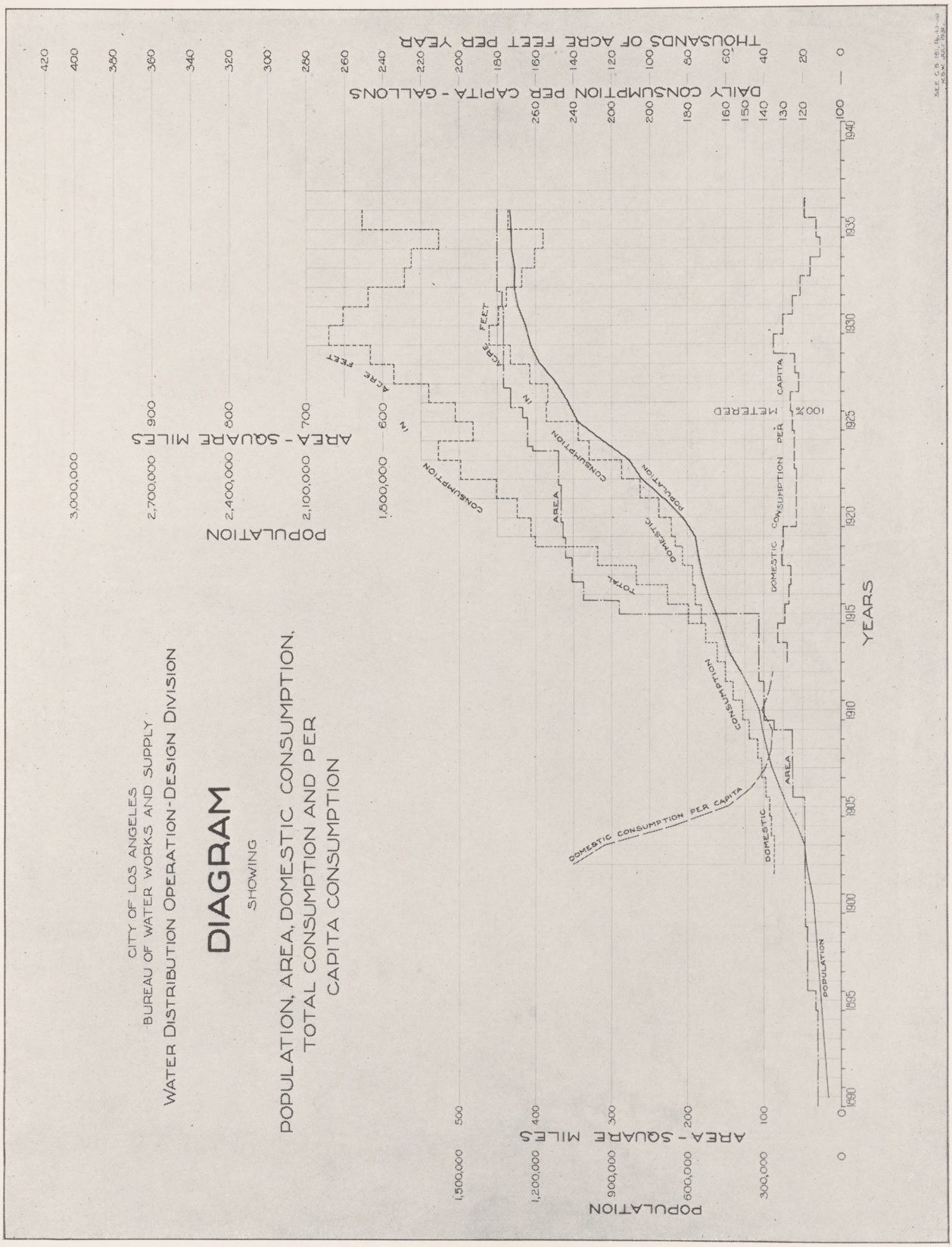
2½" Single	3,155
2½" Double	5
2½"x4" Double	54
4" Double	.....
	3,214

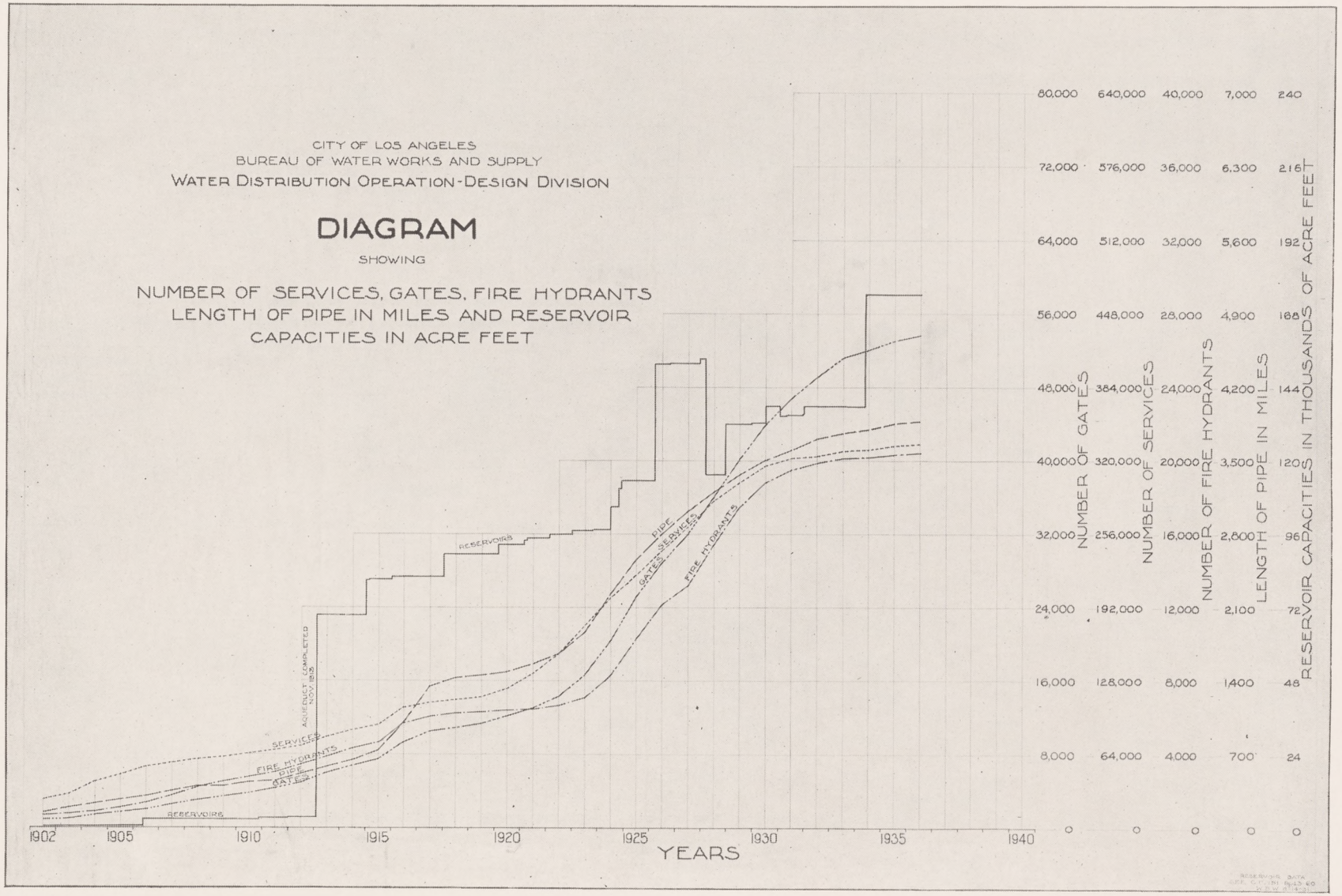
	In System June 30, 1935	Net Increase	In System June 30, 1936
Los Angeles City	15,929	63	15,992
Harbor District	1,193	24	1,217
San Fernando District	3,194	20	3,214
	20,316	107	20,423

CONTENTS OF LOS ANGELES DOMESTIC WATER DISTRIBUTING SYSTEM

NOTE: Based on Mains 4" Up, excluding Conduits

YEAR (JUNE 30)	CONTENTS OF ENTIRE SYSTEM GALLONS	MILES OF PIPE IN SYSTEM	GALLONS PER MILE OF PIPE	EQUIVALENT DIAMETER OF PIPE INCHES
1920	59,153,862	1,489.562	39,710.88	13.576"
1925	77,403,896	2,569.453	30,122.40	11.824"
1926	79,639,641	2,792.613	28,517.28	11.506"
1927	79,302,570	3,020.212	26,252.16	11.038"
1928	83,983,150	3,195.977	26,273.48	11.043"
1929	86,877,185	3,358.610	25,867.00	10.956"
1930	87,240,636	3,500.260	24,924.04	10.756"
1931	96,319,643	3,606.403	26,707.95	11.133"
1932	104,864,560	3,711.150	28,256.62	11.453"
1933	106,670,845	3,761.521	28,358.43	11.474"
1934	108,114,027	3,801.351	28,440.95	11.491"
1935	108,193,959	3,828.447	28,260.01	11.453"
1936	111,314,704	3,871.218	28,754.44	11.552"


CITY OF LOS ANGELES
BUREAU OF WATER WORKS AND SUPPLY
WATER DISTRIBUTION OPERATION-DESIGN DIVISION
DIAGRAM
SHOWING
POPULATION, AREA, DOMESTIC CONSUMPTION, TOTAL CONSUMPTION AND PER CAPITA CONSUMPTION
POPULATION
AREA - SQUARE MILES
DAILY CONSUMPTION PER CAPITA - GALLONS
THOUSANDS OF ACRE FEET PER YEAR
YEARS
DOMESTIC CONSUMPTION PER CAPITA
DOMESTIC CONSUMPTION
AREA
POPULATION
TOTAL CONSUMPTION
ACRE FEET
IN
DOMESTIC CONSUMPTION PER CAPITA METERED
100%


CITY OF LOS ANGELES
BUREAU OF WATER WORKS AND SUPPLY
WATER DISTRIBUTION OPERATION-DESIGN DIVISION
DIAGRAM
SHOWING
NUMBER OF SERVICES, GATES, FIRE HYDRANTS
LENGTH OF PIPE IN MILES AND RESERVOIR
CAPACITIES IN ACRE FEET
AQUEDUCT COMPLETED NOV. 1913
RESERVOIRS
PIPE
SERVICES
GATES
FIRE HYDRANTS
1902
1905
1910
1915
1920
1925
1930
1935
1940
YEARS
80,000 640,000 40,000 7,000 240
72,000 576,000 36,000 6,300 216
64,000 512,000 32,000 5,600 192
56,000 448,000 28,000 4,900 168
48,000 384,000 24,000 4,200 144
40,000 320,000 20,000 3,500 120
32,000 256,000 16,000 2,800 96
24,000 192,000 12,000 2,100 72
16,000 128,000 8,000 1,400 48
8,000 64,000 4,000 700 24
0 0 0 0 0
NUMBER OF GATES
NUMBER OF SERVICES
NUMBER OF FIRE HYDRANTS
LENGTH OF PIPE IN MILES
RESERVOIR CAPACITIES IN THOUSANDS OF ACRE FEET

SERVICES

DISTRICT	Miles of Pipe		Active Services In System		Active Services Per Mile of Pipe		Lineal Feet of Pipe Between Services	
	June 30 1935	June 30 1936	June 30 1935	June 30 1936	June 30 1935	June 30 1936	June 30 1935	June 30 1936
Main City	2,649.144	2,665.161	226,966	230,323	85.675	86.420	61.628	61.097
Harbor	219.888	232.266	12,110	12,507	55.073	53.847	95.872	98.054
San Fernando Valley	959.415	973.791	20,724	22,703	21.601	23.314	244.437	226.473
TOTAL	3,828.447	3,871.218	259,800	265,533	67.860	68.592	73.958	76.977

GATES

DISTRICT	Miles of Pipe		Gates		Gates Per Mile of Pipe		Lineal Feet of Pipe Between Gates	
	June 30 1935	June 30 1936	June 30 1935	June 30 1936	June 30 1935	June 30 1936	June 30 1935	June 30 1936
Main City	2,649.144	2,665.161	37,207	37,554	14.045	14.091	375.937	374.715
Harbor	219.888	232.266	3,174	3,251	14.435	13.997	365.787	377.227
San Fernando Valley	959.415	973.791	12,629	12,891	13.163	13.238	401.118	398.853
TOTAL	3,828.447	3,871.218	53,010	53,696	13.846	13.871	381.328	380.662

FIRE HYDRANTS

DISTRICT	Miles of Pipe		Fire Hydrants		Fire Hydrants Per Mile of Pipe		Lineal Feet of Pipe Between Hydrants	
	June 30 1935	June 30 1936	June 30 1935	June 30 1936	June 30 1935	June 30 1936	June 30 1935	June 30 1936
Main City	2,649.144	2,665.161	15,929	15,992	6.013	6.000	878.114	879.943
Harbor	219.888	232.266	1,193	1,217	5.425	5.240	973.185	1,007.694
San Fernando Valley	959.415	973.791	3,194	3,214	3.329	3.301	1,586.009	1,599.756
TOTAL	3,828.447	3,871.218	20,316	20,423	5.307	5.276	945.767	1,000.834

SERVICES

DISTRICT	MILES OF PIPE		ACTIVE SERVICES IN SYSTEM		ACTIVE SERVICES PER MILE OF PIPE		LINEAL FEET OF PIPE BETWEEN SERVICES	
	JUNE 30 1935	JUNE 30 1936	JUNE 30 1935	JUNE 30 1936	JUNE 30 1935	JUNE 30 1936	JUNE 30 1935	JUNE 30 1936
Main City	2,649.144	2,665.161	226,966	230,323	85.675	86.420	61.628	61.097
Harbor	219.888	232.266	12,110	12,507	55.073	53.847	95.872	98.054
San Fernando Valley	959.415	973.791	20,724	22,703	21.601	23.314	244.437	226.473
TOTAL	3,828.447	3,871.218	259,800	265,533	67.860	68.592	73.958	76.977

GATES

DISTRICT	MILES OF PIPE		GATES		GATES PER MILE OF PIPE		LINEAL FEET OF PIPE BETWEEN GATES	
	JUNE 30 1935	JUNE 30 1936	JUNE 30 1935	JUNE 30 1936	JUNE 30 1935	JUNE 30 1936	JUNE 30 1935	JUNE 30 1936
Main City	2,649.144	2,665.161	37,207	37,554	14.045	14.091	375.937	374.715
Harbor	219.888	232.266	3,174	3,251	14.435	13.997	365.787	377.227
San Fernando Valley	959.415	973.791	12,629	12,891	13.163	13.238	401.118	398.853
TOTAL	3,828.447	3,871.218	53,010	53,696	13.846	13.871	381.328	380.662

FIRE HYDRANTS

DISTRICT	MILES OF PIPE		FIRE HYDRANTS		FIRE HYDRANTS PER MILE OF PIPE		LINEAL FEET OF PIPE BETWEEN HYDRANTS	
	JUNE 30 1935	JUNE 30 1936	JUNE 30 1935	JUNE 30 1936	JUNE 30 1935	JUNE 30 1936	JUNE 30 1935	JUNE 30 1936
Main City	2,649.144	2,665.161	15,929	15,992	6.013	6.000	878.114	879.943
Harbor	219.888	232.266	1,193	1,217	5.425	5.240	973.185	1,007.694
San Fernando Valley	959.415	973.791	3,194	3,214	3.329	3.301	1,586.009	1,599.756
TOTAL	3,828.447	3,871.218	20,316	20,423	5.307	5.276	945.767	1,000.834

PIPE REPORT, FISCAL YEAR 1935-1936, ENDING JUNE 30, 1936

Summary of 4″ in Diameter and Larger

DISTRICT	Total in System 6-30-35	Laid 1935—1936	Acquired 1935—1936	Removed & Abandoned 1935—1936	Total in System 6-30-36
Los Angeles City	2661.699 Miles	28.921 Miles	..... Miles	12.903 Miles	2677.717 Miles
Harbor	219.888 "	8.334 "	4.422 "	.398 "	232.266 "
San Fernando Valley	973.411 "	28.513 "	1.002 "	15.139 "	987.787 "
GRAND TOTAL	3854.998 Miles	65.768 Miles	5.424 Miles	28.420 Miles	3897.770 Miles
					3854.998 "
				NET GAIN	42.772 Miles

Note: 26 miles of conduits are included in the above totals.

PIPE CLASSIFICATION

Entire Distribution System (Conduits Excluded)

	Concrete	STEEL										CAST IRON															
		Riveted		Not Electric Welded							Electric Welded	American Water Works Standard (Vertical Sand Cast)					Centrifugal Cast						Horizontal Cast (McWane)			
								Bell & Spigot Steel									de Lavaud			Sand Moulded						
									Mannesman																		
			(Concrete Covered)	O.D. Casing	Standard Screw	Butt Welded Joint	Victaulic Coupling	Math.		Wrapped	B & S Joint	Welded Joints	B	B/C	C	D	Metro'n Joint	Medium	Heavy	Extra Heavy	Medium	Heavy	Extra Heavy	Light	Medium	Heavy	Extra Heavy
L. A. City Miles	.....	76.097	0.988	25.399	135.879	4.090	0.813	48.273	16.652	0.010	19.763	9.630	1536.392	8.868	127.478	1.066	.....	114.976	52.065	78.852	47.086	130.526	72.125	0.395	88.918	57.138	12.680
% of Total	.....	2.855		0.953	5.098	0.153	0.031	1.811	0.625		0.742	0.361	57.647	0.333	4.783	0.040	.....	4.314	1.954	2.959	1.767	4.897	2.706	0.015	3.336	2.144	0.476
Group Miles	.....	76.097 Mi.		231.106 Mi.							29.393 Mi.		2328.565 Mi.														
Group %	.....	2.855%		8.671%							1.103%		87.371%														
Harbor Miles	.....	0.819		0.051	0.391	0.128	.....	.....	0.469		6.380	0.051	151.582	.....	2.445	0.369	0.317	9.893	10.017	6.350	18.321	8.191	1.319	.....	13.313	0.885	1.291
% of Total	.....	0.353		0.029	0.168	0.055	.....	.....	0.202		2.747	0.023	65.262	.....	1.052	0.159	.....	4.259	4.313	2.734	7.888	3.527	0.568	.....	5.732	0.381	0.556
Group Miles	.....	0.819 Mi.		1.038 Mi.							6.431 Mi.		223.976 Mi.														
Group %	.....	0.353%		0.447%							2.769%		96.431%														
San Fernando Miles	1.249	221.676	6.521	0.381	11.339	0.844	.....	261.009	98.943	3.237	5.973	13.279	76.308	.....	27.853	.....	.....	42.379	51.611	58.453	8.835	10.410	45.809	.....	27.626	6.085	3.728
% of Total	0.128	22.764		0.039	1.164	0.087	.....	26.803	10.161		0.613	1.364	7.836	.....	2.860	.....	.....	4.352	5.300	6.004	0.907	1.069	4.704	.....	2.837	0.625	0.383
Group Miles	1.249 Mi.	221.676 Mi.		372.516 Mi.							19.252 Mi.		359.098 Mi.														
Group %	0.128%	22.764%		38.254%							1.977%		36.877%														
Entire System Total Miles	1.249	298.592	7.509	25.831	147.610	5.062	0.813	309.282	116.064	3.279	32.116	22.960	1764.282	8.868	157.776	1.435	0.317	167.248	113.693	143.655	74.242	149.127	119.253	0.395	129.857	64.108	17.699
% of Total	0.032	7.713		0.667	3.813	0.131	0.021	7.989	2.998		0.830	0.593	45.574	0.229	4.076	0.037	.....	4.320	2.937	3.711	1.918	3.852	3.081	0.010	3.355	1.656	0.457
Group Miles	1.249 Mi.	298.592 Mi.		604.662 Mi.							55.076 Mi.		2911.639 Mi.														
Group %	0.032%	7.713%		15.619%							1.423%		75.213%														

*610′ of 66″ and 23,166′ of 72″ are covered with oil and stone as a protection against corrosion (City Trunk Line).

Note: 54.210 Miles of Temporary Mains Less Than 4″ in Diameter Are Not Taken into Account in above Tabulation.

Los Angeles City District ..... 16.907 miles of Cast Iron Pipe were Laid
Harbor District ..... 1.822 miles of Cast Iron Pipe were Laid
San Fernando Valley District ..... 28.338 miles of Cast Iron Pipe were Laid
Entire System ..... 47.067 miles (or 5,269 tons) of Cast Iron Pipe were Laid

PIPE REPORT, FISCAL YEAR 1935-1936, ENDING JUNE 30, 1936
LOS ANGELES CITY DISTRICT

Size	Total 6/30/35	% of Total	Extensions	Better-ments	Enlarge-ments	Acquired	Removals	Abandoned	Net Change	Total 6/30/36	% of Total
4″	4,579,979	32.743	6,223	2,878	.....	.....	45,494	8,544	— 44,937	4,535,042	32.227
5″	5,121	0.037	.....	.....	.....	.....	712	.....	— 712	4,409	0.031
6″	4,807,283	34.368	31,663	12,501	.....	.....	4,893	3,623	+ 35,648	4,842,931	34.415
7″	987	0.007	.....	.....	.....	.....	.....	.....	.....	987	0.007
8″	2,280,638	16.305	11,612	24	50,352	.....	33	964	+ 60,991	2,341,629	16.641
4″— 8″	11,674,008	83.460	49,498	15,403	50,352	.....	51,132	13,131	+ 50,990	11,724,998	83.321
10″	208,115	1.448	.....	.....	.....	.....	691	540	— 1,231	206,884	1.470
12″	1,016,409	7.267	6,448	428	1,233	.....	359	.....	+ 7,750	1,024,159	7.278
14″	11,654	0.083	.....	.....	.....	.....	.....	.....	.....	11,654	0.083
10″—14″	1,236,178	8.838	6,448	428	1,233	.....	1,050	540	+ 6,519	1,242,697	8.831
4″—14″	12,910,186	92.298	55,946	15,831	51,585	.....	52,182	13,671	+ 57,509	12,967,695	92.152
16″	171,219	1.224	.....	.....	.....	.....	.....	.....	.....	171,219	1.217
18″	54,146	0.387	.....	.....	.....	.....	.....	.....	.....	54,146	0.385
20″	100,226	0.717	.....	.....	.....	.....	117	719	— 836	99,390	0.706
16″—20″	325,591	2.328	.....	.....	.....	.....	117	719	— 836	324,755	2.308
4″—20″	13,235,777	94.626	55,946	15,831	51,585	.....	52,299	14,390	+ 56,673	13,292,450	94.460
22″	4,909	0.035	.....	.....	.....	.....	.....	.....	.....	4,909	0.035
* 23″	980	0.007	.....	.....	.....	.....	.....	.....	.....	980	0.007
24″	319,108	2.281	112	185	.....	.....	108	1,265	— 1,076	318,032	2.261
25″	6,438	0.046	.....	.....	.....	.....	.....	.....	.....	6,438	0.046
27″	8,163	0.058	.....	.....	.....	.....	.....	.....	.....	8,163	0.058
30″	163,281	1.167	.....	68	.....	.....	63	.....	+ 5	163,286	1.160
31″	000	0.000	28,976	.....	.....	.....	.....	.....	+ 28,976	28,976	0.206
36″	144,275	1.032	.....	.....	.....	.....	5	.....	— 5	144,270	1.025
40″	63,778	0.456	.....	.....	.....	.....	.....	.....	.....	63,778	0.453
42″	10,332	0.074	.....	.....	.....	.....	.....	.....	.....	10,332	0.073
44″	905	0.006	.....	.....	.....	.....	.....	.....	.....	905	0.006
45″	5,704	0.041	.....	.....	.....	.....	.....	.....	.....	5,704	0.041
48″	2,119	0.015	.....	.....	.....	.....	.....	.....	.....	2,119	0.015
52″	16,896	0.121	.....	.....	.....	.....	.....	.....	.....	16,896	0.120
60″	490	0.004	.....	.....	.....	.....	.....	.....	.....	490	0.003
68″	4,326	0.031	.....	.....	.....	.....	.....	.....	.....	4,326	0.031
22″—68″	751,704	5.374	29,088	253	.....	.....	176	1,265	+ 27,900	779,604	5.540
4″—68″	13,987,481	100%	85,034	16,084	51,585	.....	52,475	15,655	+ 84,573	14,072,054	100%
Miles in System	2,649.144		16.105	3.046	9.770	.....	9.938	2.965		2,665.161	
Laid				(28.921 Miles)			Net Gain 15.998 Miles				

* Previously listed with 22″

16.105 Miles of Mains were laid for Extensions, 9.894 miles of which are Cast Iron Pipe.

12.816 Miles of Mains were laid for Betterments and Enlargements, 12.251 miles of which are Cast Iron Pipe.

9.770 Miles of these were Enlarged to 8″ and 12″.

PIPE REPORT, FISCAL YEAR 1935-1936, ENDING JUNE 30, 1936
SAN FERNANDO VALLEY DISTRICT

Size	Total 6-30-35	% of Total	Extensions	Better-ments	Enlarge-ments	Acquired	Removals	Abandoned	Net Change	Total 6-30-36	% of Total
4″	435,543	8.598	1,710	.....	.....	5,289	9	132	+ 6,858	442,401	8.604
6″	1,995,208	39.387	59,563	7,309	.....	.....	9,344	38,231	+ 19,297	2,014,505	39.181
8″	1,128,591	22.279	15,947	158	42,611	.....	10,514	13,180	+ 35,022	1,163,613	22.631
4″—8″	3,559,342	70.264	77,220	7,467	42,611	5,289	19,867	51,543	+ 61,177	3,620,519	70.416
10″	813	.016	.....	.....	.....	.....	.....	.....	.....	813	.016
12″	683,413	13.491	1,955	5,666	15,630	.....	3,805	2,899	+ 16,547	699,960	13.614
14″	202,895	4.005	.....	.....	.....	.....	1,822	.....	— 1,822	201,073	3.910
10″—14″	887,121	17.512	1,955	5,666	15,630	.....	5,627	2,899	+ 14,725	901,846	17.540
4″—14″	4,446,463	87.776	79,175	13,133	58,241	5,289	25,494	54,442	+ 75,902	4,522,365	87.956
16″	116,716	2.304	.....	.....	.....	.....	.....	.....	.....	116,716	2.270
18″	27,675	.546	.....	.....	.....	.....	.....	.....	.....	27,675	.538
20″	43,443	.858	.....	.....	.....	.....	.....	.....	.....	43,443	.845
16″—20″	187,834	3.708	.....	.....	.....	.....	.....	.....	.....	187,834	3.653
4″—20″	4,634,297	91.484	79,175	13,133	58,241	5,289	25,494	54,442	+ 75,902	4,710,199	91.609
22″	12,022	.237	.....	.....	.....	.....	.....	.....	.....	12,022	.234
24″	84,523	1.669	.....	.....	.....	.....	.....	.....	.....	84,523	1.644
27″	5,854	.116	.....	.....	.....	.....	.....	.....	.....	5,854	.114
30″	60,178	1.188	.....	.....	.....	.....	.....	.....	.....	60,178	1.170
32″	5,397	.107	.....	.....	.....	.....	.....	.....	.....	5,397	.105
33″	9,378	.185	.....	.....	.....	.....	.....	.....	.....	9,378	.182
36″	50,604	.999	.....	.....	.....	.....	.....	.....	.....	50,604	.984
38″	240	.004	.....	.....	.....	.....	.....	.....	.....	240	.005
39″	21,041	.415	.....	.....	.....	.....	.....	.....	.....	21,041	.409
40″	11,054	.218	.....	.....	.....	.....	.....	.....	.....	11,054	.215
42″	8,679	.171	.....	.....	.....	.....	.....	.....	.....	8,679	.168
45″	7,860	.155	.....	.....	.....	.....	.....	.....	.....	7,860	.153
48″	5,210	.103	.....	.....	.....	.....	.....	.....	.....	5,210	.101
50″	7,888	.156	.....	.....	.....	.....	.....	.....	.....	7,888	.153
51″	36,197	.715	.....	.....	.....	.....	.....	.....	.....	36,197	.704
52″	20,041	.396	.....	.....	.....	.....	.....	.....	.....	20,041	.390
54″	15,313	.302	.....	.....	.....	.....	.....	.....	.....	15,313	.298
60″	3,717	.073	.....	.....	.....	.....	.....	.....	.....	3,717	.072
62″	2,519	.050	.....	.....	.....	.....	.....	.....	.....	2,519	.049
64″	9,828	.194	.....	.....	.....	.....	.....	.....	.....	9,828	.191
66″	15,877	.313	.....	.....	.....	.....	.....	.....	.....	15,877	.309
68″	1,761	.035	.....	.....	.....	.....	.....	.....	.....	1,761	.034
72″	34,391	.679	.....	.....	.....	.....	.....	.....	.....	34,391	.669
78″	1,844	.036	.....	.....	.....	.....	.....	.....	.....	1,844	.036
22″—78″	431,416	8.516	.....	.....	.....	.....	.....	.....	.....	431,416	8.391
4″—78″	5,065,713	100%	79,175	13,133	58,241	5,289	25,494	54,442	+ 75,902	5,141,615	100%
Miles in System	959.415		14.995	2.487	11.031	1.002	4.828	10.311		973.791	
Laid			(	28.513 Miles	)	1.002	NET GAIN	14.376 Miles			

14.995 Miles of Mains were laid for Extensions, 14.980 Miles of which are Cast Iron Pipe.
13.518 Miles of Mains were laid for Betterments and Enlargements, 13.358 Miles of which are Cast Iron Pipe.
11.031 Miles of these were enlarged to 8″ and 12″.

Size	American Water Works Stand (Vertical Sand Cast)			
	B	B/C	C	Sto Bel
4″	*4,199,902	.....	334,429	....
5″	4,409	.....	.....	....
6″	3,404,826	.....	190,205	2,3
7″	526	.....	.....	....
8″	612,612	.....	67,516	2,7
10″	243,044	.....	.....	....
12″	442,093	10,800	117,307	....
14″	70	.....	.....	....
16″	72,993	5,436	42,149	9
18″	15,370	.....	9,036	....
20″	131,932	.....	4,829	....
24″	119,307	30,588	67,584	....
30″	68,206	.....	.....	....
36″	121	.....	.....	....
Total Feet.....	9,315,411	46,824	833,055	5,9
Total Miles.....	1,764.282	8.868	157.776	1.1
% of Total.....	60.594	0.305	5.419	0.0
Group Feet.....			10,202,868	
Group Miles....			1,932.361 Mi.	
Group %.....			66.367%	
June 30, 1930				
Group Miles....			2,018.483 Mi.	
Group %.....			81.250%	

*Reduced 414,425 feet since 1930

TIONS Mains on basis emerged to 6 and 12 .

PIPE REPORT, FISCAL YEAR 1935-1936, ENDING JUNE 30, 1936
SAN FERNANDO VALLEY DISTRICT

Size	Total 6-30-35	% of Total	Extensions	Better-ments	Enlarge-ments	Acquired	Removals	Abandoned	Net Change	Total 6-30-36	% of Total
4″	435,543	8.598	1,710	.....	.....	5,289	9	132	+ 6,858	442,401	8.604
6″	1,995,208	39.387	59,563	7,309	.....	.....	9,344	38,231	+ 19,297	2,014,505	39.181
8″	1,128,591	22.279	15,947	158	42,611	.....	10,514	13,180	+ 35,022	1,163,613	22.631
4″—8″	3,559,342	70.264	77,220	7,467	42,611	5,289	19,867	51,543	+ 61,177	3,620,519	70.416
10″	813	.016	.....	.....	.....	.....	.....	.....	.....	813	.016
12″	683,413	13.491	1,955	5,666	15,630	.....	3,805	2,899	+ 16,547	699,960	13.614
14″	202,895	4.005	.....	.....	.....	.....	1,822	.....	— 1,822	201,073	3.910
10″—14″	887,121	17.512	1,955	5,666	15,630	.....	5,627	2,899	+ 14,725	901,846	17.540
4″—14″	4,446,463	87.776	79,175	13,133	58,241	5,289	25,494	54,442	+ 75,902	4,522,365	87.956
16″	116,716	2.304	.....	.....	.....	.....	.....	.....	.....	116,716	2.270
18″	27,675	.546	.....	.....	.....	.....	.....	.....	.....	27,675	.538
20″	43,443	.858	.....	.....	.....	.....	.....	.....	.....	43,443	.845
16″—20″	187,834	3.708	.....	.....	.....	.....	.....	.....	.....	187,834	3.653
4″—20″	4,634,297	91.484	79,175	13,133	58,241	5,289	25,494	54,442	+ 75,902	4,710,199	91.609
22″	12,022	.237	.....	.....	.....	.....	.....	.....	.....	12,022	.234
24″	84,523	1.669	.....	.....	.....	.....	.....	.....	.....	84,523	1.644
27″	5,854	.116	.....	.....	.....	.....	.....	.....	.....	5,854	.114
30″	60,178	1.188	.....	.....	.....	.....	.....	.....	.....	60,178	1.170
32″	5,397	.107	.....	.....	.....	.....	.....	.....	.....	5,397	.105
33″	9,378	.185	.....	.....	.....	.....	.....	.....	.....	9,378	.182
36″	50,604	.999	.....	.....	.....	.....	.....	.....	.....	50,604	.984
38″	240	.004	.....	.....	.....	.....	.....	.....	.....	240	.005
39″	21,041	.415	.....	.....	.....	.....	.....	.....	.....	21,041	.409
40″	11,054	.218	.....	.....	.....	.....	.....	.....	.....	11,054	.215
42″	8,679	.171	.....	.....	.....	.....	.....	.....	.....	8,679	.168
45″	7,860	.155	.....	.....	.....	.....	.....	.....	.....	7,860	.153
48″	5,210	.103	.....	.....	.....	.....	.....	.....	.....	5,210	.101
50″	7,888	.156	.....	.....	.....	.....	.....	.....	.....	7,888	.153
51″	36,197	.715	.....	.....	.....	.....	.....	.....	.....	36,197	.704
52″	20,041	.396	.....	.....	.....	.....	.....	.....	.....	20,041	.390
54″	15,313	.302	.....	.....	.....	.....	.....	.....	.....	15,313	.298
60″	3,717	.073	.....	.....	.....	.....	.....	.....	.....	3,717	.072
62″	2,519	.050	.....	.....	.....	.....	.....	.....	.....	2,519	.049
64″	9,828	.194	.....	.....	.....	.....	.....	.....	.....	9,828	.191
66″	15,877	.313	.....	.....	.....	.....	.....	.....	.....	15,877	.309
68″	1,761	.035	.....	.....	.....	.....	.....	.....	.....	1,761	.034
72″	34,391	.679	.....	.....	.....	.....	.....	.....	.....	34,391	.669
78″	1,844	.036	.....	.....	.....	.....	.....	.....	.....	1,844	.036
22″—78″	431,416	8.516	.....	.....	.....	.....	.....	.....	.....	431,416	8.391
4″—78″	5,065,713	100%	79,175	13,133	58,241	5,289	25,494	54,442	+ 75,902	5,141,615	100%
Miles in System	959.415		14.995	2.487	11.031	1.002	4.828	10.311		973.791	
Laid			(	28.513 Miles	)	1.002	NET GAIN	14.376 Miles			

14.995 Miles of Mains were laid for Extensions, 14.980 Miles of which are Cast Iron Pipe.
13.518 Miles of Mains were laid for Betterments and Enlargements, 13.358 Miles of which are Cast Iron Pipe.
11.031 Miles of these were enlarged to 8″ and 12″.

CAST IRON PIPE SUMMARY

ENTIRE WATER DISTRIBUTION SYSTEM—JUNE 30, 1936

Size	American Water Works Standard (Vertical Sand Cast)					Centrifugal Cast (deLavaud)			Centrifugal Cast (Sand Moulded)			Horizontal Cast (McWane)						
	B	B/C	C	D Std. Bell	D Metn. Jnt.	Medium	Heavy	Extra Heavy	Medium	Heavy	Extra Heavy	Light	Medium	Heavy	Extra Heavy	Total Feet	Total Miles	% of Total
4″	*4,199,902	.....	334,429	.....	.....	200,299	.....	.....	34,832	.....	.....	2,086	5,742	.....	.....	*4,777,290	904.790	31.075
5″	4,409	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4,409	.835	0.029
6″	3,404,826	.....	190,205	2,304	.....	671,447	285,421	.....	346,195	31,345	.....	.....	679,898	126,089	.....	5,737,730	1086.691	37.322
7″	526	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	526	.100	.003
8″	612,612	.....	67,516	2,700	.....	.....	288,261	543,294	.....	715,675	159,323	.....	.....	212,401	71,986	2,673,768	506.395	17.392
10″	243,044	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	243,044	46.031	1.581
12″	442,093	10,800	117,307	.....	1,200	.....	1,384	214,893	.....	.....	470,334	.....	.....	.....	21,467	1,279,478	242.325	8.323
14″	70	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	70	.013	.001
16″	72,993	5,436	42,149	902	472	11,312	20,239	.....	10,754	4,371	.....	.....	.....	.....	.....	168,628	31.937	1.097
18″	15,370	.....	9,036	.....	.....	.....	2,299	.....	.....	.....	.....	.....	.....	.....	.....	27,017	5.117	.176
20″	131,932	.....	4,829	.....	.....	9	2,699	312	219	7,290	.....	.....	.....	.....	.....	146,978	27.837	.956
24″	119,307	30,588	67,584	.....	.....	.....	.....	.....	.....	28,710	.....	.....	.....	.....	.....	246,189	46.627	1.601
30″	68,206	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	68,206	12.918	.444
36″	121	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	121	.023	.001
Total Feet	9,315,411	46,824	833,055	5,906	1,672	883,067	600,303	758,499	392,000	787,391	629,657	2,086	685,640	338,490	93,453			
Total Miles	1,764.282	8.868	157.776	1.118	0.317	167.247	113.694	143.655	74.243	149.127	119.253	0.395	129.856	64.108	17.700			
% of Total	60.594	0.305	5.419	0.038	0.011	5.744	3.905	4.934	2.550	5.121	4.096	0.013	4.460	2.202	0.608			
Group Feet	10,202,868					2,241,869			1,809,048			1,119,669				15,373,454		
Group Miles	1,932.361 Mi.					424.596 Mi.			342.623 Mi.			212.059 Mi.				**2,911.638 Mi.		
Group %	66.367%					14.583%			11.767%			7.283%						100%
June 30, 1930 Group Miles	2,018.483 Mi.					177.653 Mi.			156.832 Mi.			131.322 Mi.				***2,484.290 Mi.		
Group %	81.250%					7.151%			6.313%			5.286%						100%

*Reduced 414,425 feet since 1930

*Reduced 424,029 feet since 1930

**75% of all pipe in System in 1936

***71% of all pipe in System in 1930

11.031 Miles of these were enlarged to 8″ and 12″.

PIPE REPORT, FISCAL YEAR 1935-1936, ENDING JUNE 30, 1936

HARBOR DISTRICT

Size	Total 6-30-35	% of Total	Extensions	Betterments	Enlargements	Acquired	Removals	Abandoned	Net Change	Total 6-30-36	% of Total
4″	204,530	17.617	2,089	.....	.....	250	83	437	+ 1,819	206,349	16.826
5″	1,117	.096	.....	.....	.....	.....	.....	.....	.....	1,117	.091
6″	614,687	52.944	1,609	247	.....	12,560	785	9	+ 13,622	628,309	51.233
8″	143,105	12.326	2,299	1,290	1,950	6,654	.....	.....	+ 12,193	155,298	12.664
4″—8″	963,439	82.983	5,997	1,537	1,950	19,464	868	446	+ 27,634	991,073	80.814
10″	44,849	3.863	.....	.....	.....	2,267	60	.....	+ 2,207	47,056	3.837
12″	61,604	5.306	.....	65	.....	1,615	.....	.....	+ 1,680	63,284	5.160
14″	70	.006	.....	.....	.....	.....	.....	.....	.....	70	.006
10″—14″	106,523	9.175	.....	65	.....	3,882	60	.....	+ 3,887	110,410	9.003
4″—14″	1,069,962	92.158	5,997	1,602	1,950	23,346	928	446	+ 31,521	1,101,483	89.817
16″	26,179	2.255	.....	14	.....	.....	.....	.....	+ 14	26,193	2.136
18″	624	.054	.....	.....	.....	.....	.....	.....	.....	624	.050
20″	63,975	5.510	202	252	.....	.....	474	151	— 171	63,804	5.203
16″—20″	90,778	7.819	202	266	.....	.....	474	151	— 157	90,621	7.389
4″—20″	1,160,740	99.977	6,199	1,868	1,950	23,346	1,402	597	+ 31,364	1,192,104	97.206
24″	000	.000	290	14	.....	.....	.....	.....	+ 304	304	.022
30″	270	.023	.....	.....	.....	.....	.....	.....	.....	270	.025
31″	000	.000	33,686	.....	.....	.....	.....	.....	+ 33,686	33,686	2.747
24″—31″	270	.023	33,976	14	.....	.....	.....	.....	+ 33,990	34,260	2.794
4″—31″	1,161,010	100%	40,175	1,882	1,950	23,346	1,402	597	+ 65,354	1,226,364	100%
Miles in System	219.888		7.609	.356	.369	4.422	.265	.113		232.266	
Laid				(8.334 Miles)		4.422	NET GAIN	12.378 Miles			

7.609 Miles of Mains were laid for Extensions, 1.170 Miles of which are Cast Iron Pipe.
.725 Miles of Mains were laid for Betterments and Enlargements, .667 Miles of which are Cast Iron Pipe.
.369 Miles of these were enlarged to 8″.

Water Sales Section—New Business and Extensions

THAD M. ERWIN, *Water Sales Agent*

FOLLOWING is a report showing the volume of business transacted and total amount of collections made by the Water Sales Section of the Bureau of Water Works and Supply for the fiscal year ending June 30, 1936, this report including all districts:

TOTAL NUMBER OF STREET MAIN EXTENSION ORDERS ISSUED:	
Main District Office and West Los Angeles Office	319
Van Nuys District Office	186
Harbor District Office	35
TOTAL	540

COLLECTIONS

Street Main Assessment Charges Street Main Deposit Charges Acreage Supply Assessment Charges	$ 53,053.60
Service Connection Charges with Extensions	8,046.00
Street Improvement Contracts	75.00
Fire Hydrants (Cash Sales)	2,600.00
Labor and Material Jobs	16,502.15
New Subdivisions and Industrial Tracts:	
Main Office Collections Transmitted by Cash Credit Memorandums to District Offices	40,643.30
Fire Hydrants installed for and billed to Los Angeles Fire Department	9,085.93
TOTAL	$130,005.98

Total outstanding amount for extensions where estimates have been furnished but no payment made prior to July 1, 1936 ..... $114,460.00

Following the gradual uptrend of business in general, the above figures show a larger total on new business than for any year since 1932; and the total for that year included the sum $66,111.97 for Street Improvement Contracts, which has gradually decreased to $75.00 for this year.

This financial report is exclusive of other promotional activities which were ultimately diverted into commercial or other channels.

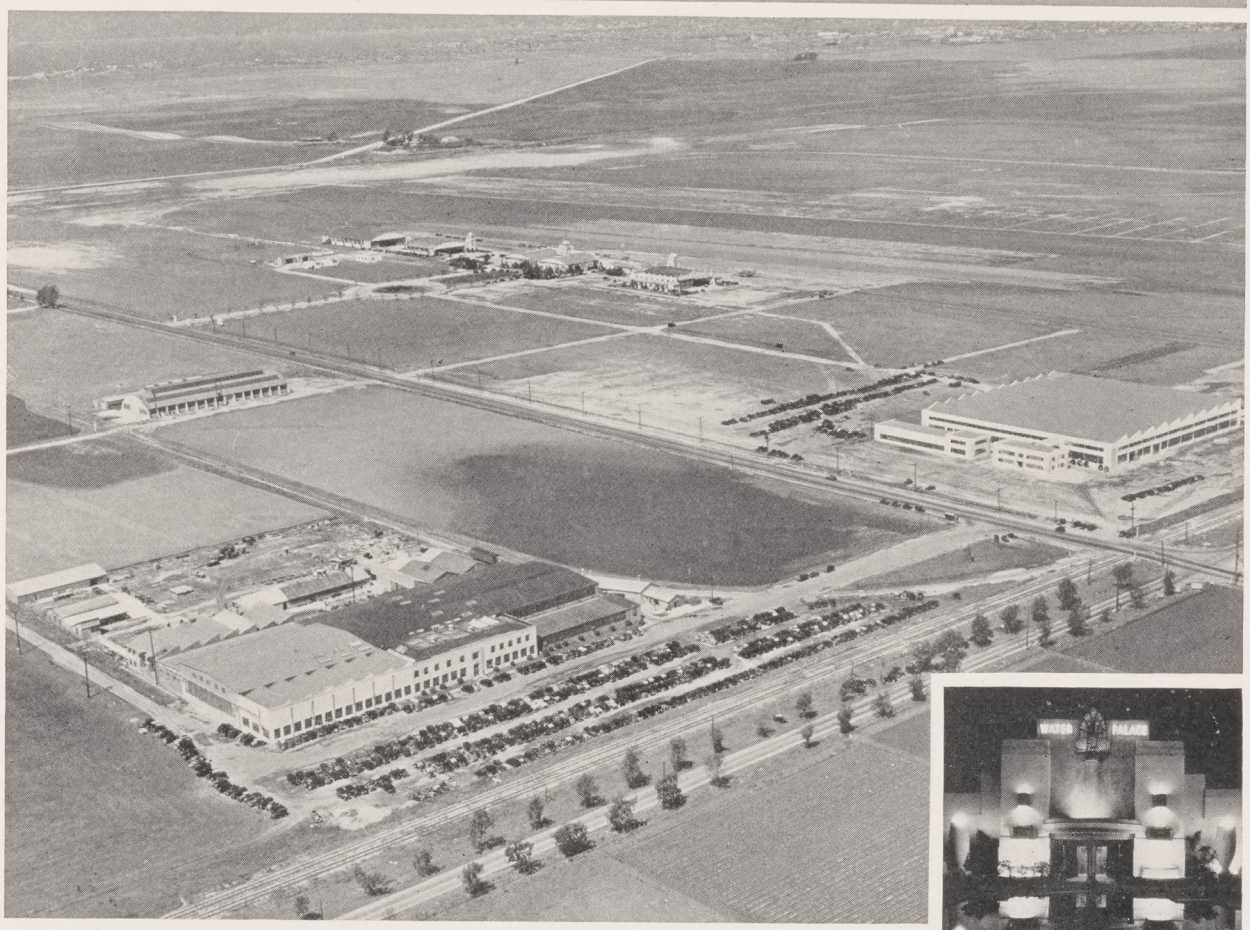
There has been a great increase in activities in connection with the piping of new subdivisions as well as in the completion of old subdivisions; our records show 26 tracts were piped and estimates furnished for 56 new tracts.

During the past year various committees have been interviewed and they have been furnished with information on requirements necessary in order to obtain a City water supply, should they be successful in their annexations. These committees represented Lennox, Hawthorne, Kagle Canyon, Morrow Heights, Calabasas, Olivita Heights, the county district around Gardena, and the North Wilmington District.

At the request of various service organizations and engineering groups, arrangements were made for speaking engagements for the Chief Engineer and General Manager, and for the Engineer of Water Works. These talks were in connection with the history and development of the Los Angeles water supply and the problems encountered, and were illustrated by moving pictures and suitable slides and maps.

At the request of district representatives from Lakeside Park, Sunland and Tujunga, Torrance, Uplifters Ranch, and Walnut Acres, special investigations were made in connection with the formation of Municipal Improvement Districts and they were informed of the procedure necessary in order to obtain a City water supply.

Final arrangements were made for the acquisition of two water systems installed in Tracts 9759 and 7555.



(Top) Air photo of Los Angeles municipal airport, showing adjacent airplane factories. At present undeveloped, the large territory surrounding the airport will be susceptible to improvement for industrial and other purposes with completion of the new 36-inch Stone Canyon Trunk Line of the municipal Water Bureau. (Bottom) Extension of municipal water service to a San Fernando Valley subdivision was followed within six months by development shown in foreground and right distance.

(Inset) Night view of Water Palace, California Pacific International Exposition, San Diego.

Since the installation of our 36-inch main to the Los Angeles Harbor District, approximately three hundred new domestic, commercial and industrial services have been added in the Shoestring Strip in territory heretofore supplied by the Torrance Water Company through Department mains installed under the 1911 Act, and water mains were extended in this area in order to meet the increased demand.

The extension of our 36-inch Stone Canyon line to serve the Municipal Airport and adjacent properties, will open up a territory which should expand rapidly with this new assured water supply. This office has already negotiated with the Municipal Airport, University City, Loyola University, and various owners of industrial properties, including the North American Aircraft Corporation, for services.

Arrangements have been completed for the extension of water main for the Los Angeles Fire Department, Mountain Patrol No. 2, on Mulholland Highway; also for service for the Los Angeles Yacht Club at Terminal Island.

Negotiations are now under way regarding our furnishing the fish canneries at the Harbor with an adequate supply of City water—instead of the salt water in use at the present time.

Amendments to the County Water Rate Ordinance were prepared, giving a common carrier rate and a new sewer flushing rate. The City Water Rate Ordinance was temporarily amended in January, giving a special ¾ cent rate for gravity irrigation water, for a period of two months. Complete new water rate ordinances were prepared in May, increasing certain water rates, but action was postponed pending other arrangements.

Final negotiations were made with U. S. engineers for a suitable water supply for the following projects: Hollywood and Main Los Angeles post offices, Federal prison and Federal warehouses.

During the past year the Water Sales Section has been responsible for the approval or disapproval of all combination irrigation and domestic service applications for all districts, the total number amounting to approximately 6,100.

The Department has had an increasing number of requests for the privilege of time payments on Street Main Assessment charges, necessitating the preparation of 87 contracts by the Water Sales Section for the approval of the Legal Division and the Board of Water and Power Commissioners.

Our Water Palace exhibit at the California Pacific International Exposition in San Diego, jointly sponsored by the Bureau of Water Works and Supply, the Metropolitan Water District and Imperial County, was closed in November and re-opened in February, 1936, for another six months. This exhibit featured a huge diorama portraying our present Los Angeles-Owens Valley Aqueduct with supplementing Mono Basin Project, the Metropolitan Water District Aqueduct, Boulder Dam and the Bureau of Power and Light's new 270-mile power transmission line, and the future location of the All-American Canal. This very attractive exhibit received a special scroll of honor from the Exposition officials for being one of the four outstanding exhibits. It was felt that our work on this exhibit was well worth while, as every one of the more than a million visitors must have been convinced of the very important part water has played in the development of this once semi-arid country, and realized that the Southern California communities to be furnished with water through these three great systems are destined to be the future outstanding agricultural and industrial areas in America.

Sanitary Engineering Division

R. F. GOUDEY, *Sanitary Engineer*

DURING the fiscal year the laboratory and the field functions of the Sanitary Engineering Division were materially improved in order to effect better sanitary control of the water supply and reduce complaints from vegetable tastes and odors to a minimum. The laboratory conducted various tests itemized in Table No. 1.

TABLE No. 1

LABORATORY TESTS

TEST	NUMBER MADE	PURPOSE
Bacteriological	27,673	Control of safety of supply.
Microscopical	5,362	Control of plankton growths in reservoirs.
Sanitary Chemical	1,525	Control of sanitary quality of water.
Partial Sanitary Chemical	732	Control of sanitary quality of water.
Complete Mineral	717	For industrial, commercial, agricultural, and domestic use.
Partial Mineral	2,026	For industrial, commercial, agricultural, and reservoir control.
TOTAL	38,035	

In the field the Sanitary Engineering Division conducted tests on 1,376 samples in the control of proper reservoir outlet elevations.

The Sanitary Engineering Division supervised the collection of all water samples, operated all chlorination stations, perfected residual chlorination at the San Fernando Chlorination Station, treated reservoirs with copper sulphate by the method described in the previous annual report, initiated a plan of collecting samples at each possible outlet elevation from all reservoirs where, in addition to chemical tests, odors, tastes, and temperatures were taken, patrolled reservoirs for enforcement of all sanitary conditions relating to the protection of water supplies, continued a definite program on the elimination of cross-connections, investigated all complaints where sanitary quality of water was involved, and cooperated with the Building and Safety Department in drawing up an ordinance safeguarding water systems from faulty plumbing. The total number of laboratory and field tests run for the protection of the water was 52,848. Compared with the previous year it is noted that the total number of tests is only slightly less in spite of the closing down of the Wilmington Treatment Plant. The number of bacteriological tests was increased about 10%.

The laboratory, as in the previous year, operated with a certificate of approval from the State Department of Public Health and carried on cooperative research with a joint committee of the American Water Works Association and the American Public Health Association. It conducted several lines of research described later in the report. Bacteriological, mineral, and sanitary chemical analyses were made at all camps operated by both the Bureau of Water Works and Supply and the Bureau of Power and Light.

BACTERIOLOGICAL CONTROL

The procedure during the fiscal year was to analyze all samples according to a strict interpretation of Standard Methods of Water Analysis by the American Public Health Association, with additional confirmation tests by methyl red, Voges-Proskauer, and formate broth. Parallel tests were made in over 3,000 samples using the standard procedure above mentioned with direct counting of the members of the coli-aerogenes group of ferro cyanide citrate media developed by Tunney and Noble at Chicago. Results of this work were most encouraging and during the coming fiscal year it will be used as a substitute test for a number of sampling points.

The following tabulation gives a complete bacteriological summary of sources of water supply before treatment and a second tabulation gives complete bacteriological information on samples as delivered in the distribution system.

TABLE NO. 2

TABULATION OF BACTERIOLOGICAL ANALYSES

SOURCES OF SUPPLY—UNTREATED WATERS ONLY

LOCATION	Total Samples	3 or more tubes positive		Total No. of Portions	Portions positive	
		No. of Samples	% of Samples (5% all'd)		No. of Portions	% of Portions (10% all'd)
OWENS VALLEY AQUEDUCT						
Owens River at Thompson's Ranch	11	3	27.27	55	16	29.09
Owens River at Zurich	7	5	71.43	35	28	80.00
Bouquet Reservoir	35	0	0.00	175	4	2.28
Bouquet By-Pass	38	0	0.00	190	2	1.05
Haiwee Inlet	14	5	35.71	70	30	42.86
Haiwee Outlet	14	0	0.00	70	1	1.43
Fairmont Inlet	39	0	0.00	195	11	5.64
Fairmont Outlet	39	2	5.13	195	12	6.15
Dry Canyon Inlet	42	0	0.00	210	8	3.81
Dry Canyon Outlet	349	5	1.43	1745	64	3.66
Upper San Fernando Outlet	306	35	11.43	1530	222	14.44
Lower San Fernando Outlet	512	47	9.18	2560	272	10.62
Franklin Reservoir	181	0	0.00	905	6	0.66
Hollywood Reservoir	375	2	0.53	1875	24	1.28
Weighted Average	1962	104	5.30	9810	700	7.13
LOS ANGELES RIVER GALLERIES AND WELLS						
Headworks	306	3	0.98	1530	22	1.44
Crystal Springs	307	4	1.30	1535	29	1.88
Weighted Average	613	7	1.14	3065	51	1.66
HARBOR WELLS						
Lomita	135	0	0.00	675	0	0.00
Wilmington	76	0	0.00	380	0	0.00
Weighted Average	211	0	0.00	1055	0	0.00
ALL SOURCES						
Owens Valley Aqueduct	1962	104	5.30	9810	700	7.13
L. A. River Galleries and Wells	613	7	1.14	3065	51	1.66
Harbor Wells	211	0	0.00	1055	0	0.00
Weighted Average	2786	111	3.98	13930	751	5.39

Compared with last year the raw water of the aqueduct system showed considerable improvement, particularly so far as Upper and Lower San Fernando Reservoirs are concerned. It is believed this great improvement is due in part to a cleanup program initiated by the Sanitary Engineering Division, removing all sources of pollution which would wash into Upper and Lower San Fernando Reservoirs following heavy periods of rainfall and in part by the cooperation of the Southern Pacific Railroad and the Pullman Company in the locking of toilets on all trains crossing the watersheds of these two reservoirs.

The treated samples show about 20% improvement over last year, particularly below Lower San Fernando Reservoir. It is believed that this is due almost entirely to effective chlorination by residual chlorine control equipment installed at that location. It is noted that the delivered water complied strictly with the bacteriologi-

TABLE NO. 3

TABULATION OF BACTERIOLOGICAL ANALYSES

DISTRIBUTION SAMPLES—WATER AS DELIVERED

LOCATION	Total Samples	3 or more tubes positive		Total No. of Portions	Portions positive	
		No. of Samples	% of Samples (5% all'd)		No. of Portions	% of Portions (10% all'd)
SAN FERNANDO VALLEY						
Maclay High Line	506	1	0.19	2530	6	0.24
San Fernando 54" Line	308	2	0.65	1540	19	1.23
San Fernando 72" Line	308	1	0.32	1540	17	1.04
Chatsworth High Line	391	1	0.26	1955	19	0.97
Chatsworth Res., Outlet	253	2	0.79	1265	19	1.50
Encino Res., Outlet	259	0	0.00	1295	17	1.31
Mission Wells	49	1	2.04	245	6	2.45
House Samples	2149	2	0.09	10745	53	0.49
Weighted Average	4223	10	0.24	21115	156	0.74
LOS ANGELES DIVISION AQUEDUCT						
Stone Canyon Res.	352	1	0.28	1760	17	0.97
Franklin Canyon Res.	365	0	0.00	1825	4	0.22
Hollywood Res.	1038	2	0.19	5190	38	0.73
House Samples	4235	62	1.46	21175	456	2.15
Weighted Average	5990	65	1.09	29950	515	1.72
LOS ANGELES RIVER SYSTEM						
Headworks	364	0	0.00	1820	0	0.00
Bellevue Inlet	228	0	0.00	1140	0	0.00
Buena Vista Inlet	365	0	0.00	1825	0	0.00
Ascot Res.	49	0	0.00	245	1	0.41
Pollock Wells	2	0	0.00	10	0	0.00
House Samples	2777	1	0.04	13885	46	0.33
Weighted Average	3785	1	0.03	18925	47	0.24
LOS ANGELES RIVER AND AQUEDUCT MIXED						
Silver Lake Res.	252	5	1.98	1260	36	2.86
Eagle Rock	1114	0	0.00	5570	14	0.25
Business District	877	4	0.44	4385	36	0.82
House Samples	1869	3	0.16	9345	60	0.64
Weighted Average	4112	12	0.29	20560	146	0.71
HARBOR AREA						
Lomita Wells	1198	3	0.25	5990	46	0.76
Wilmington Wells	932	4	0.43	4660	45	0.97
Aqueduct	3795	5	0.13	18975	125	0.66
Weighted Average	5925	12	0.20	29625	216	0.73
ALL DISTRIBUTION SAMPLES						
San Fernando Valley	4223	10	0.24	21115	156	0.74
Los Angeles Divn. Aqueduct	5990	65	1.09	29950	515	1.72
Los Angeles River System	3785	1	0.03	18925	47	0.24
Los Angeles River and Aqueduct Mixed	4112	12	0.29	20560	146	0.71
Harbor Area	5925	12	0.20	29625	216	0.73
Weighted Average	24035	100	0.41	120175	1080	0.89

cal standards set by the Treasury Department of the United States Public Health Service and that the raw water as delivered to the City reservoirs met the same standard even before treatment.

The highest incidence of E. coli occurred in the month of October following the first rains of the wet season, while the lowest number of organisms of this group were found during the late summer and also during December and January which were practically rainless. An average of 5.15% of all samples showed gas formation in lactose at the end of twenty-four hours incubation. Of these an average of 69% were confirmed for E. coli. In addition to this, 29.60% of all samples analyzed showed gas formation in lactose at the end of forty-eight hours with 3.05% of these confirmed for E. coli. The samples this year showed a slight improvement in the number of samples proved positive for E. coli.

As can be seen from the figures given in the preceding paragraph a high percentage of samples showing gas formation in lactose broth at the end of forty-eight hours incubation does not indicate the presence of a correspondingly high number of organisms of the E. coli group. There are present in the Los Angeles water supply a large number of bacteria which give spurious results in the standard tests used to determine the degree of fecal contamination. The anaerobic spore formers of the Clostridia group comprise the largest number of these organisms. They appear in the greatest quantity during December, January, March and April, and caused over half of the forty-eight hour presumptive tests. An aerobic spore forming organism which splits lactose has also been encountered quite frequently. This bacterium also interferes with the partially completed test giving a growth very much like that of E. coli on eosine methylene blue agar. During the months of July, August, September, October, May and June a great number of organisms of the aerogenes section of the coli aerogenes group appear. These bacteria of predominantly soil and grain origin outnumber those of the coli section two and one-half to one and are without sanitary significance.

The great diversity of bacteria present in the Los Angeles water supply can be seen from the following list of organisms which have been isolated during the past year. They are: bacteria of the coli-aerogenes group, including A. cloacae and several varieties of E. coli; Proteus, including a variety which ferments lactose; bacilli of the aerobic spore forming type such as B. mycoides, B. subtilis, and the lactose splitting bacillus which has been called B. aerosporus; a great number of anaerobic spore formers of the A. welchii type; and various natural water bacteria such as those of the genera Pseudomonas and Flavobacterium, a few micrococci, M. candicam, and M. lutea, and a species of Azotobacter which ferments lactose.

Additional work remains to be done in determining what other specific organisms interfere with the detection of E. coli by tests now employed in the bacteriological laboratory. With the information so far gained it has been found that of the various confirmatory media tried out during the past year the eosine methylene blue agar is the most successful. Formate ricinoleate has been tried out as a confirmatory test on over 15,000 samples and was found to be utterly valueless. It did eliminate anaerobes but made no distinction between E. coli and other Gram negative organisms.

During the year parallel tests were made on over 3,300 samples comparing a direct method of counting members of the coli-aerogenes group on ferro cyanide citrate media with the regular standard procedure. Eight hundred of the samples were raw waters and the remainder were on various treated waters. The new method showed about the same E. coli count with raw waters as that determined by the standard procedure. The treated waters, however, showed that 5% of the samples were called positive by the new method where the standard procedure would have failed to have found them. This discrepancy of the two methods is due to the fact that under standard procedure the lactose broth enriches some of the original organisms present in the water so that at the end of the period of enrichment there is a different proportion of various organisms to that which existed in the original sample. The direct plate immediately isolates each original organism and there is no interference with other organisms. The new method not only differentiates between E. coli of fecal origin and members of the E. coli-aerogenes group which are not of fecal origin. It gives a direct count of these two groups within thirty-six hours after the samples are plated which is seven to ten days faster than the old procedure. By using the new method on one-third of the samples on the regular schedule, greater control is obtained so far as safety of the water is concerned with no additional increase in cost of materials or in labor.

In addition to the identification of organisms and the use of various media besides those specified in the routine tests as outlined in "Standard Methods of Water Analysis" changes have been made in the material and equipment used in the bacteriological laboratory. A four-ounce bacterial bottle with a wide mouth and a screw-on top has been substituted for the ground glass stoppered one formerly used. This is much easier to use, allows of less danger of contamination both in taking and plating the sample, and is more economical. Metal beer bottle tops have been substituted for cotton plugs in use with the regular fermentation tubes. Merck's lactose and peptone have replaced the Difco brand and give comparative results. A substance called Annite has been

Fleet of cars used in collecting samples of water for the more than 38,000 laboratory tests made each year.

found very successful in cleaning glassware. All of these changes have resulted in the saving of time, labor, and money without any decrease in the reliability of the work done.

During the year four special sampling trucks were placed in service. On the sides were painted the words "Laboratory Control—Drink City Water." Many favorable comments were received on this publicity feature of keeping the idea before the public that City water is safe for drinking purposes.

SANITARY CHEMICAL CONTROL

During the past year, the Sanitary Engineering Division continued the periodic examination of water samples collected at strategic points in the system in order to determine the keeping qualities of the water as well as to correlate the bacteriological and microscopical findings by means of sanitary chemical tests.

The ammonia and nitrite contents were slightly higher than in the previous year while the nitrates decreased. The total organic nitrogen appeared to be materially reduced due primarily to better control of algae in reservoirs and also to a more accurate method of examination. Dissolved oxygen in the water was four to six times greater than the oxygen demand of organic material in the water which is a very good indication of a water which will give but little trouble in the distribution system.

The aqueduct water indicated a small decrease in alkalinity with a corresponding slight increase in carbon dioxide. The color and turbidity of the aqueduct supply, particularly at Haiwee Reservoir, was somewhat greater than those reported last year, but the water entering San Fernando Valley had but a slight increase in color over last year and no increase in turbidity. The river sources did not indicate any change in the ammonia, nitrite, and nitrate contents. The organic nitrogen, however, showed a remarkable reduction and improvement over last year. The dissolved oxygen content of the river water was greater than last year, while the biochemical oxygen demand was less, which also indicated a decided improvement over last year. There was very little change in other constituents.

The water from the various sources as delivered to the City proper showed considerable improvement in nitrogen and oxygen contents indicating that the water was of far better sanitary quality than during the previous year so far as its keeping qualities in the distribution system were concerned. The carbon dioxide content and color were slightly increased over last year but the turbidity remained unchanged. The beneficial change in the harbor supply in which local sources were supplanted with aqueduct water, showed considerable improvement in the sanitary quality of water so far as color, turbidity, and stability of the water in the harbor distribution system was concerned. In the City of Los Angeles proper and all districts supplied by the Department, the supply complied strictly with the sanitary requirements of the United States Treasury Department standards for potable drinking water.

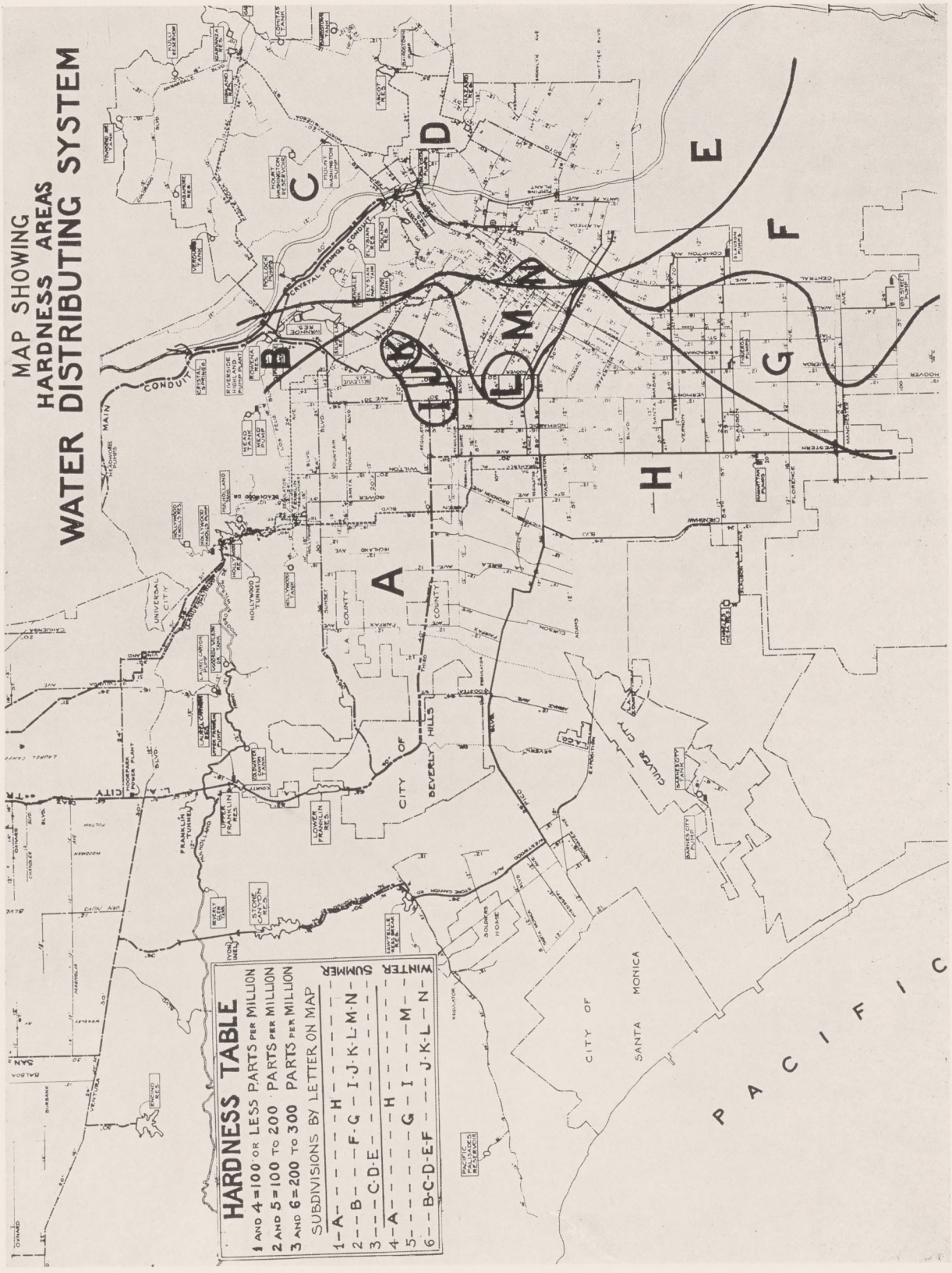
SUMMARY OF SANITARY CHEMICAL TESTS COVERING AQUEDUCT AND LOCAL SOURCES

RESULTS IN P.P.M.

	Nitrogen as N				Oxygen			Alkalinity as $CaCO_3$	Chlorides	Carbon Dioxide	Color	Turbidity	Hydrogen ion pH
	Ammonia	Nitrites	Nitrates	Total Organic	Dissolved	Consumed	Demand 5 day						
MONO BASIN SYSTEM:													
Grant Lake	0.002	0.	0.01	0.162	8.9	2.58	2.7	25.	5.	1.4	14.	14.	7.5
LeeVining Creek	0.001	0.	0.02	0.118	8.8	1.61	1.8	18.	5.	1.4	11.	2.	7.2
AQUEDUCT SYSTEM:													
Owens R. at Thompson Ranch	0.002	0.	0.01	0.103	8.9	1.79	2.2	73.	12.	0.2	13.	8.	8.0
Owens R. at Crooked Creek	0.	0.	0.01	0.170	8.5	3.82	1.9	128.	29.	0.3	27.	9.	8.1
Owens R. at Five Bridges	0.	0.002	Trace	0.175	8.4	4.30	1.7	125.	26.	0.6	28.	9.	8.0
Owens R. at Zurich Bridge	0.004	0.	0.03	0.204	8.5	4.51	2.3	117.	23.	0.5	31.	21.	8.0
Wt. Average of Main Tributaries to Owens R.	0.002	0.	0.	0.117	9.0	2.02	2.1	62.	13.	0.7	13.	4.	7.7
Haiwee Inlet	0.022	0.001	0.02	0.198	9.0	3.65	2.5	104.	22.	0.1	30.	61.	8.1
Haiwee Outlet	0.001	0.001	0.01	0.187	8.6	3.01	2.2	116.	23.	0.	26.	14.	8.3
San Fernando Valley	0.003	Trace	0.03	0.206	9.6	3.10	2.3	125.	26.	Trace	21.	6.	8.2
RIVER SYSTEM:													
Headworks Gallery & Wells	0.	0.	2.24	0.069	9.1	1.07	1.5	187.	28.	4.6	6.	2.	7.6
Crystal Springs	0.	0.	2.18	0.076	8.5	1.00	1.5	195.	31.	6.8	6.	2.	7.4
Headworks Wells	0.	0.	1.87	0.057	8.9	0.98	0.8	180.	22.	2.7	5.	3.	7.7
Pollock Wells	0.002	0.	1.75	0.084	8.6	1.44	2.1	186.	40.	5.7	7.	1.	7.2
CITY PROPER:													
From Aqueduct Sources	0.001	Trace	0.04	0.167	9.1	2.54	1.9	127.	24.	0.2	17.	4.	8.1
From River Sources	0.004	0.003	1.26	0.089	8.4	1.51	1.8	183.	31.	5.4	9.	3.	7.8
From Mixed Sources (Business District and Eagle Rock Area)	0.003	0.004	0.72	0.167	9.2	2.13	2.3	159.	28.	0.9	13.	3.	7.9
HARBOR SYSTEM:													
Lomita Wells*	0.186	0.	0.	0.252	3.8	1.50	3.8	192.	29.	0.	19.	2.	8.3
Wilmington Wells*	0.130	0.001	Trace	0.401	6.0	6.80	1.5	214.	69.	0.	73.	1.	8.2
Harbor Distribution**	0.011	Trace	0.10	0.157	8.1	2.33	1.8	132.	30.	1.0	14.	3.	8.0

*Taken out of service October, 1935.

**Includes three months of data obtained when the district was served by Wilmington and Lomita Wells.


MAP SHOWING
HARDNESS AREAS
WATER DISTRIBUTING SYSTEM
HARDNESS TABLE
1 AND 4=100 OR LESS PARTS PER MILLION
2 AND 5=100 TO 200 PARTS PER MILLION
3 AND 6=200 TO 300 PARTS PER MILLION
SUBDIVISIONS BY LETTER ON MAP
WINTER SUMMER
1—A— — — — — H— — — — —
2— —B— — —F·G— I·J·K·L·M·N—
3— — —C·D·E— — — — — — —
4—A— — — — — H— — — — —
5— — — — — G— I— — —M— —
6— —B·C·D·E·F— — —J·K·L— —N—
A
B
C
D
E
F
G
H
I
J
K
L
M
N
CRYSTAL SPRINGS CONDUIT
MAIN
CONDUIT
CITY OF BEVERLY HILLS
CITY OF SANTA MONICA
PACIFIC

MINERAL ANALYSES

The general survey of the mineral quality of the water in the entire system initiated last year was continued and extended to cover daily fluctuations of the two main sources of supply within the distribution system. Tests for iron and silica were added to the determinations usually made in complete mineral analyses. A comparison of results this past year indicated a slight decrease in the sodium bicarbonate salinity of water in the Mono Basin system, the Owens Valley sources, and a 12% reduction in water delivered at San Fernando Valley as compared with the previous year.

The iron content of the aqueduct water showed a progressive increase below Haiwee Inlet while the silica decreased gradually in a downstream direction. The large proportion of diatoms present in the plankton may account for the reduction of silica in the lower reservoirs. The boron intensity of the aqueduct supply, with the exception of the station in Owens River at Thompson's Ranch, showed an appreciable decrease as compared with the results reported last year. The large quantities of water with a low boron content entering the river below Hot Creek diluted considerably the boron concentration of the aqueduct water. Below Haiwee Reservoir there was a slight increase in boron intensity as a result of evaporation.

In the Los Angeles River sources the water at Headworks Gallery, Headworks Wells, and Crystal Springs Gallery showed a slight decrease in mineralization, while the salinity of Pollock wells water increased 3% over that of last year. With the exception of the water at Headworks Gallery and Wells that from all the other River sources showed a decrease in hardness. The iron content of this water was one-tenth of that in the Aqueduct supply. The silica at the River sources was also lower than that in the Aqueduct.

The salinity of Aqueduct and River waters reaching the City distribution system was 12% and 5% less, respectively, than those reported for the previous year. The alkalinity of the waters from both sources also showed a decrease. In regard to hardness, the Aqueduct sources showed a 9% decrease, the River sources a 3% decrease, and the mixed sources a 4% increase over the values reported last year.

The regular sampling points in the distribution system were taken as control points for a large number of auxiliary stations strategically located near the boundary lines of the mixed water zone. The partial mineral analyses made on samples collected at these stations included the determination of specific electrical conductance, alkalinity, sulphates, and soap hardness. The information obtained at these sampling points served to bridge the gap between control points and allowed the Sanitary Engineering Division to accumulate a record in which the seasonal and daily fluctuations of the two main sources of supply within the distribution system may be followed.

So far as mineral quality of the water is concerned the City may be divided into three zones, the first zone supplying water from the Aqueduct with a hardness of 100 p.p.m. or less which, roughly, is that area west of a line which starts near Vermont Avenue at Hillhurst Avenue, continues southeasterly to Temple and Bixel Streets, thence southeast to Vermont Avenue at Pico Street, thence southeasterly along Washington Boulevard to Central Avenue and southwesterly to Manchester and Western Avenues. The second zone is a mixture of Aqueduct and Los Angeles River sources which vary in hardness from 100-200 p.p.m. and represents that area east of Zone 1 to a line which starts at Glendale Boulevard and the Los Angeles River south along Glendale Boulevard to Zone 1, thence directly south to Central Avenue and Adams Boulevard and finally southeast to the City line at Slauson and Santa Fe Avenues. Zone 3 has an average hardness between 200 and 300 p.p.m. and is represented by that area east of Zone 2.

In the City proper two-thirds of the area received water with a hardness of less than 100 p.p.m. About one-fourth had a hardness from 100 to 200 p.p.m. and the remainder 200 to 300 p.p.m. The average hardness for the entire city from the standpoint of area is approximately 125 p.p.m. The densest population in the City is in the vicinity of the Coliseum which had a hardness of less than 100 p.p.m. The business district is in Zone 2 and 3 with an average hardness so far as area is concerned of 200 p.p.m.

The average analyses for the mixed sources at the Harbor District showed the predominating effect of Aqueduct water over that obtained during the first four months of the year from wells in the harbor area. The yearly average change has been a 20% reduction in salinity, a 19% increase in hardness, a 21% decrease in alkalinity, and the presence of small amounts of sulphates which were absent in the water formerly used.

From the mineral standpoint the water delivered in the City and Harbor District easily met at all points the United States Treasury Department standards.

SUMMARY OF MINERAL ANALYSES COVERING AQUEDUCT AND LOCAL SOURCES

RESULTS IN P.P.M.

SOURCE OF SUPPLY	Calcium	Magnesium	Sodium	Carbonate as $CaCO_3$	Bicarbonate as $CaCO_3$	Sulphate	Chloride	Boron	Total Hardness as $CaCO_3$	Iron	Silica	Specific Electrical Conductance
MONO BASIN SYSTEM:												
Grant Lake	8	3	5	1	25	1	5	0.07	32	Trace	4	4.9
LeeVining Creek	6	3	6	0	18	2	5	0.05	27	0.	5	4.1
AQUEDUCT SYSTEM:												
Owens R. at Thompson Ranch	7	8	25	3	70	3	12	0.44	50	0.	36	17.6
Owens R. at Crooked Creek	16	5	60	8	120	14	29	1.19	61	0.1	26	36.1
Owens R. at Five Bridges	17	6	54	5	120	12	26	1.15	67	Trace	37	33.8
Owens R. at Zurich Bridge	19	5	47	5	112	20	23	0.84	68	0.1	33	32.0
Wt. Average of Main Tributaries to Owens R.	11	5	24	0	62	7	13	0.45	48	0.	19	16.6
Owens Valley Wells (Thibaut Field)	48	26	231	0	382	91	173	4.45	227	.....	.....	138.
Haiwee Inlet	18	7	38	7	97	18	22	0.63	74	0.18	22	28.6
Haiwee Outlet	21	7	45	9	107	20	23	0.66	81	0.22	23	31.8
San Fernando Valley	24	9	50	12	113	25	26	0.68	97	0.17	15	37.6
LOS ANGELES RIVER SYSTEM:												
Headworks Gallery & Wells	78	22	51	0	187	140	28	.....	286	0.01	16	72.4
Crystal Springs Gallery	71	20	46	0	195	105	31	.....	259	0.03	15	66.5
Headworks Wells	71	20	40	0	180	102	22	.....	259	0.	.....	62.5
Pollock Wells	78	26	48	0	186	138	40	.....	302	Trace	18	74.6
CITY PROPER:												
From Aqueduct Sources	25	9	47	6	121	26	25	.....	100	0.15	14	36.5
From River Sources	71	21	49	2	181	119	31	.....	263	0.06	16	67.2
From Mixed Sources (Business District and Eagle Rock)	54	17	50	4	153	97	28	.....	205	0.10	14	57.5
HARBOR SYSTEM:												
Lomita Wells	19	10	61	8	181	0	26	.....	89	0.01	.....	41.8
Wilmington Wells	13	7	122	7	207	0	69	.....	61	0.22	.....	61.3
From Mixed Sources	23	8	66	3	129	24	30	.....	90	0.15	.....	42.1

CHLORINATION TREATMENT

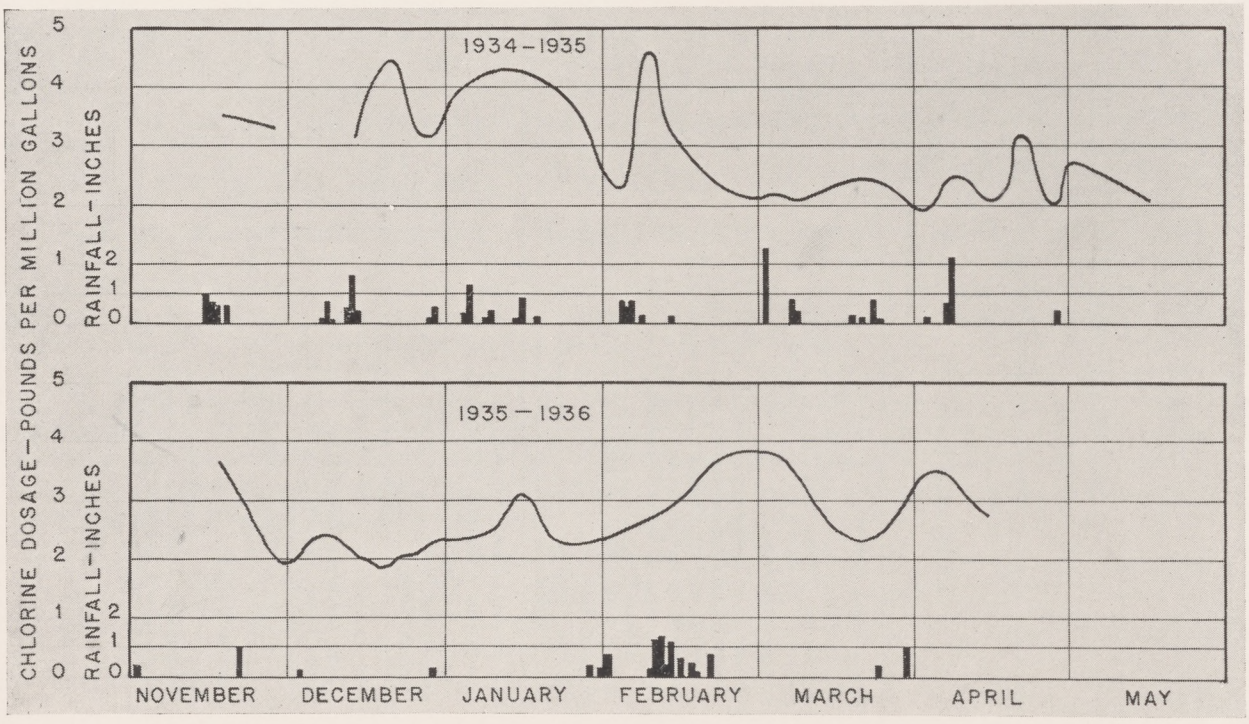
During the year one new chlorination station was established at Hollywood Knolls Pumping Plant. This is a small automatic solution feed machine treating an intermittent average flow of about 800,000 gallons per day and uses sodium hypochlorite instead of liquid chlorine. Chlorination was discontinued at Lomita and Wilmington with the closing down of these two plants in October, 1935 when the new pipe line carrying aqueduct water to the harbor area was placed in operation. The stations of Bellevue and Garvanza were finally dismantled and the equipment placed in storage. These stations have not been needed since the use of chlorine and ammonia at the River Plant.

The same careful attention was given to maintaining the dosages at the minimum consistent with proper disinfection as in previous years. As in the past, complaints of chlorinous odors and tastes were absent. The following table gives pertinent data on chlorination at the various stations:

CHLORINATION TREATMENT
AVERAGE ANNUAL RESULTS

STATION	Av. Flow Treated Sec. Ft.	Chlorine Dosage lb./m.g.		B. Coli per 100cc.		Tons Chlorine Used	Days Operated	Per Cent of Time Off
		Intended	Actual	Before Chlorination	After Chlorination			
Maclay	23.3	3.79	3.80	0.47	0.03	10.47	366	0.0
Chatsworth Inlet	39.7	4.30	4.02	8.65	0.13	13.15	255	30.4
Lower San Fernando 54"	41.9	3.56	3.45	4.24	0.12	7.71	165	55.0
Lower San Fernando 72"	168.0	**	2.44	3.70	0.04	23.65	179	51.1
Franklin	24.4	2.65	2.71	0.04	0.04	5.00	241	34.2
Mulholland 18"	1.3	2.75	2.60	0.00	0.08	6.5 *	2	99.5
Mulholland 36"	12.1	2.67	2.70	0.06	0.10	2.37	225	38.6
Mulholland 45"	44.7	2.32	2.36	0.26	0.07	9.53	282	23.0
Crystal Springs	28.1	2.57	2.60	0.84	0.00	8.63	366	0.0
Headworks	35.6	2.52	2.55	1.44	0.00	10.74	366	0.0
						91.25		

* Pounds only ** Residual control with residual of 0.8 lb./m.g.



The residual chlorine controller on the 72″ line at San Fernando which feeds the right amount of chlorine to maintain a set residual regardless of variations in chlorine demand and variations in flow was made to operate satisfactorily. Some difficulty was experienced at first with the breaking of a rheostat resistance band on the light control. This rheostat resistance has now been replaced by a rugged cam operated solenoid resistance. One other feature of the residual machine not at present entirely satisfactory is the motor operation on the vacuum controller to the chlorinator. Due to the high reduction gear ratio on the motor there is considerable lag in response to sudden changes in chlorine demand. This feature will be corrected before operation starts in the Fall, by either installing new gears or by use of a different type of control. In spite of these minor defects the residual machine gave good service and automatically varied the applied dose from a minimum of 1.6 lb. per million gallons to a maximum of 4 lb. per million gallons, always maintaining the desired residual. The average dose with the automatic residual control of the 72″ line was 2.44 lb. per million gallons, while the same water in the San Fernando 54″ line required 3.45 lb. per million gallons with manual control. This reduction of 1 lb. per million gallons for the average flow treated and days operated the past year means a saving of over ten tons of chlorine annually at this station.

The use of ammonium sulphate in place of anhydrous ammonia was tried out experimentally at the River Plant treating Crystal Springs water. An automatic solution feed machine was used and two different runs using 200 lb. per run were made. Ammonium sulphate proved fully as satisfactory as anhydrous ammonia for the formation of chloramines and it is possible that the sulphate form would be used should the price of anhydrous ammonia be further increased.

Lower San Fernando Plant was painted outside and that station, as well as all other stations and the equipment within them were given a thorough painting, cleaning, and repairing during the year. The exterior doors and woodwork of the stations at Silver Lake, Stone Canyon, and Chatsworth Outlet were also painted for protection against the weather, although these plants are dismantled and not in use at the present time.

The rainfall during the past year was subnormal and much less than the previous year. This resulted in generally lower doses and smaller average E. coli count in the raw water. Comparison of the past two years is given in Table II.

TABLE II

	1934-35	1935-36	Variation Over Previous Year
Average flow treated—Sec. ft.	40	42	+ 2
Average dose—Lb./m.g.	3.31	2.96	— 0.35
Total chlorine used—Tons	92.89	91.25	— 1.64
Total ammonia used—Tons	7.66	5.69	— 1.97
Average maximum month of raw water—E. coli index per 100cc.	32.50	8.65	—23.85
Average minimum month of raw water—E. coli index per 100cc.	0.27	0.04	— 0.23
Average month of raw water—E. coli index per 100cc.	7.82	2.19	— 5.53
Average maximum month of treated water—E. coli index per 100cc.	0.84	0.53	— 0.31
Average minimum month of treated water—E. coli index per 100cc.	0.01	0.00	— 0.01
Average month of treated water—E. coli index per 100cc.	0.25	0.06	— 0.19

United States Treasury Department standards allow 1.00 E. coli per 100cc. From Table II it may be seen that the treated water was at all times within this limit and averaged about sixteen times better than required.

By shutting off all but three of the stations from 23% to over 50% of the time during the dry season, sixty tons of chlorine were saved during the year. This, together with the ten tons saved by residual control on the San Fernando 72″ line, represents a saving of $4,500 per year.

WILMINGTON TREATMENT PLANT

The Wilmington Treatment Plant operated only during the first four months of the past fiscal year and was shut down with the completion on October 23, 1935 of the new line to the harbor supplying aqueduct water. During the remainder of the year the plant was completely overhauled and reconditioned. By May of 1936 it was in first class shape ready for service on a minute's notice should the occasion arise.

During the time of operation the plant successfully handled a raw water averaging 4 p.p.m. more color than the previous year and used 0.28 g.p.g. less ferric chloride as coagulant. The flow averaged 0.79 m.g.d. less than the previous year. The final effluent averaged 13 p.p.m.

The following table gives a summary of the operating data:

MONTHLY AVERAGED RESULTS WILMINGTON TREATMENT PLANT

1935-1936

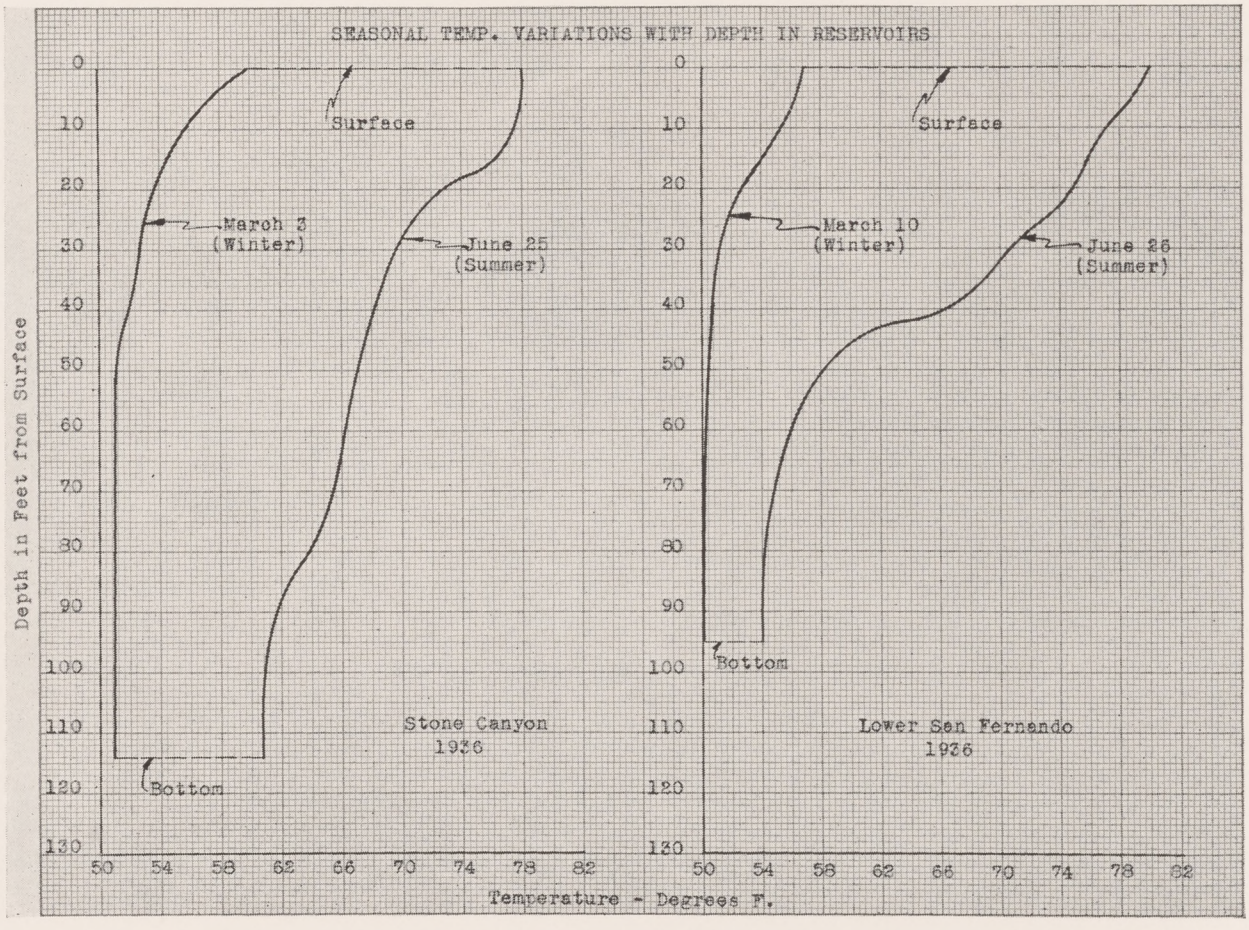
Month	Flow M.G.D.	Dose Gr./Gal.	Color P.P.M. Raw	Color P.P.M. Final
July	4.83	1.94	61	13
August	4.83	1.97	61	13
September	4.61	1.78	69	13
October*	4.34	1.68	57	13
Average	4.65	1.84	62	13

*22 days operation.

RESERVOIR CONTROL

In the control of microscopic organisms in the reservoirs the Kofoid and the net methods of plankton sampling were continued as standard procedure throughout this year as last year. The following table gives a comparison of these two methods, together with other pertinent data on temperatures and dissolved oxygen in the various reservoirs.

During the past year 82 treatments were given the reservoirs or 9 treatments less than the previous year. A total of 99.7 tons of copper sulphate were used or 7 tons less than previously. This gives an average of 6.7 tons per treatment as compared with 7.1 tons in 1934-35. This decrease in amount of copper sulphate used may be attributed largely to the use of the method developed during the past one and one-half years of scattering the dry crystals over the water instead of dragging sacks of the chemical through the water. This method



PLANKTON CONTROL OF RESERVOIRS

RESERVOIR	Ave. Plankton Year		Ave. Plankton Time of Treat.		Growths for which Treatment Applied	No. of Treatments	Tons of $CuSO_4$	Ave. Depth Ft.	Ave. Trans. Ft.*	Temperature—Deg. F.						Dissolved Oxygen % Saturated					
										Top			Bottom			Top			Bottom		
	Stand. Units	Catch P.P.M.	Stand. Units	Catch P.P.M.						Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.
Haiwee	631	2.5	3326	5.2	Anabaena—Fragilaria	3	11.20	32	7	57	70	44	55	69	42	95	105	72	88	100	69
Fairmont**	1223	2.4	3204	2.8	Fragilaria—Melosira —Asterionella	6	8.80	44	5	58	70	45	52	66	44	100	133	84	90	109	56
Bouquet**	541	1.1	755	1.8	Anabaena—Asterionella —Fragilaria	2	5.38	58	27	57	73	46	50	56	45	99	135	79	82	100	22
Dry Canyon	1230	1.1	2961	1.8	Fragilaria—Asterionella	6	4.45	13	5	59	74	44	56	69	44	100	128	81	83	108	10
U. San Fernando	1165	1.3	2656	2.5	Asterionella—Fragilaria	9	7.00	24	5	59	74	46	57	68	45	103	151	84	96	141	55
L. San Fernando	594	1.2	1270	1.8	Anabaena—Fragilaria	4	11.65	53	11	62	77	48	53	58	45	105	143	79	81	135	28
Chatsworth	1518	2.5	3860	6.5	Anabaena—Asterionella —Fragilaria	9	22.35	18	9	63	82	50	61	78	49	109	209	72	86	206	5
Encino	379	0.8	1101	2.0	Fragilaria—Cocystis —Anabaena	3	2.15	40	21	66	80	53	54	64	50	104	137	73	67	114	16
Stone Canyon	184	0.5	529	1.5	Anabaena—Aphanizomenon —Fragilaria	4	4.90	61	16	64	77	50	55	64	48	100	123	74	89	111	18
Pressure Break**	476	0.5	2394	0.5	Fragilaria—Dictyosphaerium spores	4	0.90	16	9	59	70	50	57	66	59	98	124	83	96	115	76
U. Franklin	400	0.5	1092	1.1	Anabaena—Fragilaria	10	3.36	14	10	61	73	49	59	70	49	101	122	76	97	120	72
L. Franklin	423	0.5	1114	0.4	Spores—Navicula —Fragilaria	3	2.50	32	....	65	74	50	61	72	48	108	140	79	90	112	58
U. Hollywood	463	0.7	1246	1.0	Anabaena—Fragilaria	9	2.39	21	....	63	73	50	61	70	49	98	126	71	91	109	61
L. Hollywood	358	0.8	397	0.6	Anabaena—(Cladophora in margins)	2	1.30	50	13	64	76	50	55	60	48	106	138	70	59	114	19
Silver Lake	1122	1.0	2758	1.0	Pandorina—Aphanizomenon —Fragilaria	8	11.35	26	10	68	81	54	65	73	54	124	163	77	88	173	7
Total	.....	.....	.....	.....		82	99.68	....	....	....	—	....	....	....	....	....	....	....	....	....	....
Average	714	1.2	1911	2.0		5.5	6.7	....	10	62	75	49	57	67	48	103	138	77	85	124	38
Maximum	1518	2.5	3860	6.5		.....	.....	61	27	68	82	54	65	78	59	124	209	84	97	206	76
Minimum	184	0.5	397	0.6		.....	.....	13	5	57	70	44	50	56	42	95	105	70	59	100	5

* For last two months of year only.

** Bottom dissolved oxygen for ten months only.

not only consumes much less than the old method but secures increased effectiveness of the copper as may be seen from the reduction of nearly half a ton per treatment over the previous year. This is the first year in which this method has been in standard use in the Department during the entire year at all reservoirs equipped with power boats.

The average temperature at the surface of each reservoir was about five degrees higher than at the bottom, although in Encino the differential was twelve degrees and in Lower Hollywood, Lower San Fernando, and Stone Canyon it was nine degrees. In general, those reservoirs which stratify and have a larger temperature differential have less plankton growths than those subject to vertical circulation or which have a small temperature differential between top and bottom. This is very well shown in comparing Encino, Lower San Fernando, Stone Canyon, and Lower Hollywood with Upper San Fernando, Chatsworth, Upper Franklin, Upper Hollywood, and Silver Lake. The first group averaged about ten degrees difference between top and bottom temperatures and required three treatments each, averaging five tons per reservoir per year. The second group had only a two degree temperature differential between top and bottom and required an average of nine treatments per year each, using nine tons per reservoir.

Dissolved oxygen was present in the water, top and bottom, at all times in all reservoirs. The top water averaged 103% saturation with limits of 209% and 70%. The bottom averaged 85% saturation with limits of 206% and 5%. These extreme top and bottom values were in Chatsworth and were due to excessive algal growths causing supersaturation at times of maximum growth and very low saturation following copper sulphate treatments with resultant dying of algae and their bodies sinking to the bottom. These periods of low oxygen occurred only once or twice. The average bottom dissolved oxygen at Chatsworth Reservoir was 86% which was more than ample to support fish life.

During the last half of the fiscal year a much closer investigation and supervision was made of the quality of water in the reservoirs. Two additional men have been placed on this work and all local reservoirs are visited at least once a week. Samples are taken from reservoirs at all outlet levels and field tests made for hot and cold taste and odor, carbon dioxide, temperature, dissolved oxygen, hydrogen ion concentration, water elevation in reservoirs, and gates open and closed. The results of these tests are phoned in daily to the office of the Sanitary Engineering Division. Temperatures are taken at two feet intervals of all reservoirs. Recommendations regarding opening or closing outlet gates are thereupon made based on these results so that the best water will be turned into the distribution system. Typical curves from two reservoirs, showing seasonal temperature variations with depth, are shown herewith.

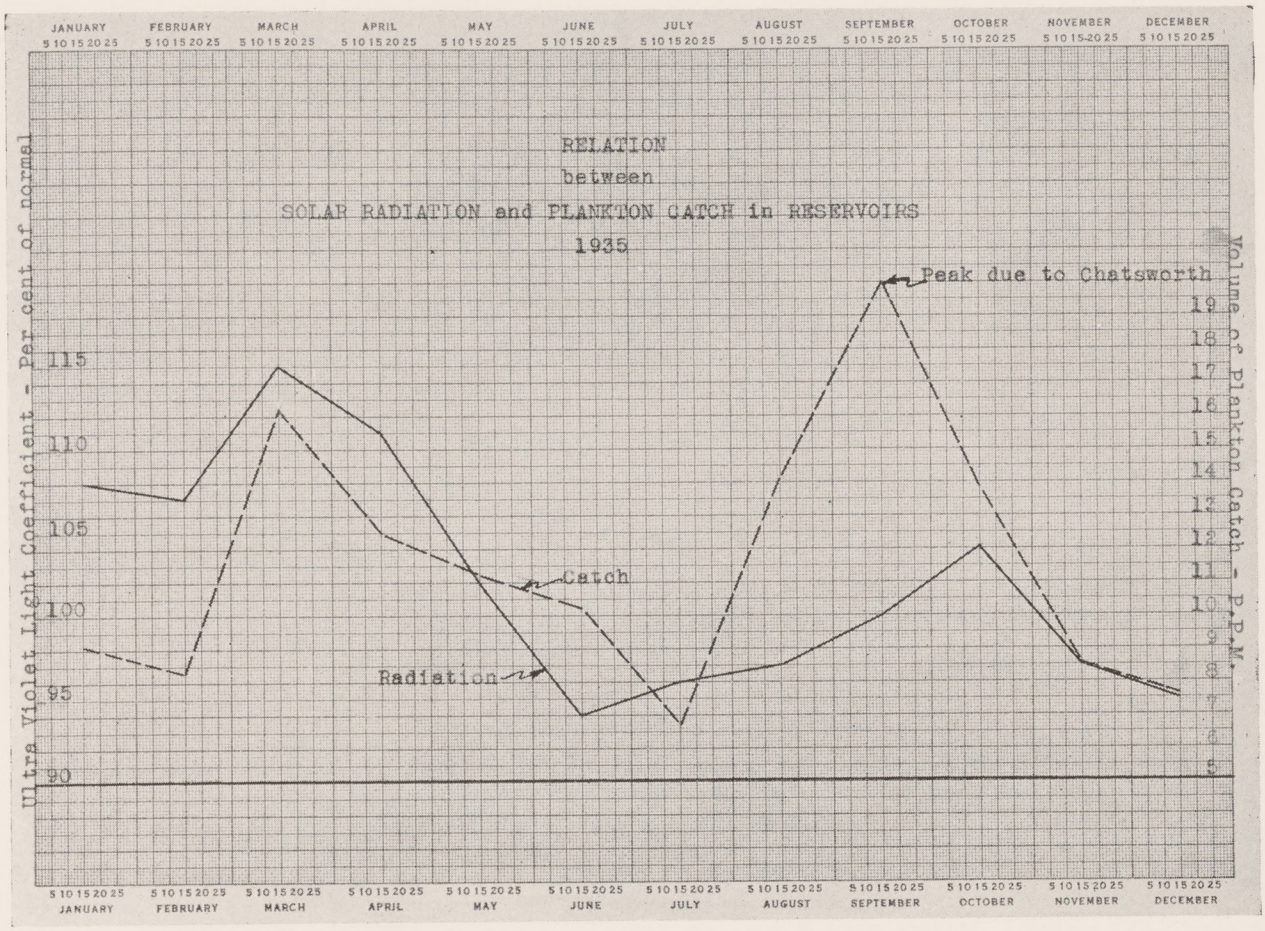
In an effort to forecast possible increase or other variations in plankton growth in reservoirs an attempt was made to correlate total monthly plankton catch with temperature, sunshine, and solar radiation or ultra violet light. A very good agreement was obtained between plankton catch and the ultra violet light coefficient as may be seen from the accompanying graph. (See page 73.)

It has been very puzzling to note that the periods of greatest algal activity did not coincide with longer hours of sunshine, increased summer temperatures, or variations in mineral or sanitary chemical constituents. In fact, the lowest plankton growths have always occurred in May, June, July, and August which have by far the hottest and longest days. By plotting the record of solar radiation or ultra violet coefficient as determined at the Mt. Wilson Observatory with the algal catch as determined at all the reservoirs, it was found that a very close relationship existed. As the ultra violet coefficient decreased the algal growth decreased. Peak periods of ultra violet intensity coincided exactly with peak growths of plankton. Ultra violet light contains the chemical or growth stimulating rays. An increase in the amount of these rays reaching the earth may be expected to be followed by an increase in plankton growth. It is expected that further work will be done on this correlation between solar radiation and plankton growth the coming year on an instrument developed to make daily records of the intensity of solar radiation at the various reservoirs. The practical value is that if the solar radiation is on the increase copper sulphate treatments will be made on lower counts of algae than if it is on the decrease. By use of this method of control more intelligent timing of copper sulphate treatments can be secured with consequent saving in amounts applied.

ELIMINATION OF CROSS CONNECTIONS

The program for the elimination of cross connections between the City water distribution system and sources of real or potential contamination was energetically continued.

There were 268 inspections of premises made for cross connections and approximately 575 individual cross connections eliminated or protected by the installation of vacuum breakers. In some cases the City water distribution system was protected from entire plants by the installation of double check valve systems which were especially designed for this purpose. There have been eight systems of double check valves installed in the past year. These systems range in sizes from 4″ to 12″ and in cost to the consumer, from $400 to $3200. The


RELATION
between
SOLAR RADIATION and PLANKTON CATCH in RESERVOIRS
1935
Peak due to Chatsworth
Catch
Radiation
Ultra Violet Light Coefficient - Per cent of normal
Volume of Plankton Catch - P.P.M.
JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER

double check valve systems are inspected every six months. All of the systems which have been installed to date have been inspected once this year and a portion of them have been inspected the second time.

The use of vacuum breakers for the protection of certain types of cross connections such as wash-down hoses in fish canneries, packing plants, etc., presupposes the passage of the flush valve and cross connection ordinance which is now proposed by the Department of Building and Safety. This ordinance has been in the state of preparation for more than two years and has as yet to be reported out of a committee of the City Council. Objections have arisen chiefly by the City Health Department, certain manufacturers, and property owners of old buildings.

Many tests of flush valves and vacuum-breakers were made by the Sanitary Engineering Division. A number of tests were made at a temporary field laboratory established by the Bureau of Water Works and Supply. This laboratory was located on Westridge Road and consisted mainly of a 12″ street main approximately 4700′ long with 270′ difference in elevations between the high and low points. Pressure was reduced from fifty pounds per square inch, static head, to 28⅝″ of mercury vacuum. Gauges, flush valves, and vacuum-breakers were attached to a fire plug for testing with a system of piping which was specially designed for that purpose. In addition to these tests a number of tests were conducted in the private laboratory owned by Mr. A. A. Bennett, Chief Plumbing Inspector, City of Los Angeles. The majority of these tests were participated in by the Sanitary Engineering Division.

A procedure to prevent the installation of cross connections, especially of the direct type, was inaugurated during the past year. This method consisted of approaching the owners and builders of new buildings using new services, and warning them of the dangers of cross connections. If this overture failed, they were warned of the present Ordinance No. 66,498 by which they would be compelled to remove any cross connections installed. It is safe to say that at least 40% of the intended cross connection installations have been prevented in this way.

A complete series of tests were made to determine the amount of water required by different types of

plumbing fixtures. All ordinary fixtures were tested, including such fixtures as flush valves, toilet tank valves, basin cocks, etc. These data are useful in determining the amount of over-demand which may be placed on small services, pipes, and reservoirs. The data will, likewise, be useful in drafting a possible future water ordinance which may govern the sizes, meters, pipes, supplies to fixtures, and similar installations, particularly where flush valves are installed.

A survey was also made of the amount of water pumped daily from the privately owned wells within the city limits of Los Angeles. This survey has not been completed at this time because of the large number of private wells used for irrigation in San Fernando Valley, as well as the salt water pumped in the harbor area, which was to be included in the survey. However, it is estimated that 7,800,000 gallons of water are pumped daily from private wells within Los Angeles City proper.

A special investigation was made of the water system of the Los Angeles Biltmore Hotel for the purpose of securing approval of the American Water Works Association prior to their national convention which was held there in June, 1936. While the primary inspection was made during the previous year, no actual alterations had been started. Therefore, many details which required supervision by this Department were carried over into this year.

WATERSHED PROTECTION

The Sanitary Engineering Division made 142 arrests for bathing in the Los Angeles River near the galleries, 9 arrests for bathing in reservoirs, and 13 defendants were prosecuted in court with an average fine of $50 for each offense. The above statistics do not represent those arrests made by reservoir carekeepers who make no reports to this Division. The work of controlling reservoir pollution from pelicans, seagulls, and coots was secured with less shooting than in the previous year. Rodent control was continued at all local reservoirs. A sanitary cleanup at Upper and Lower San Fernando watersheds and the locking of toilets on trains while crossing these watersheds resulted in considerable bacteriological improvement of the water supply in these reservoirs following heavy rains.

INVESTIGATION OF COMPLAINTS

The total number of complaints for the past year was 1,202 which was a 10% increase over the previous year which was probably due to a better system of reporting. Complaints were grouped as follows: 32, or 2.6% were for alleged sickness; 203 were for odors and tastes, representing 16.9% of the total number of complaints; 890, representing 74%, were due to rust, mud, and dirt in the water; and the remaining percentage included miscellaneous causes as well as those on which there were no grounds for complaint. In the case of the 32 complaints made of alleged sickness due to drinking water, bacteriological samples were immediately collected and analyzed. In every case the water was found to be safe absolutely and all of these alleged complaints were unfounded. Approximately 385 complaints were investigated in the field and 150 were specially investigated to check up plumbing difficulties on the premises. This last type of work has proved of much educational value to the consumer, not only in satisfactorily explaining to them the cause of the complaint in a few of the instances where the water supply was at fault, but because in the majority of cases the cause of the complaint existed on the complainants property such as improper plumbing, wrong types of hot water heaters, re-use of water, and improper water piping. The satisfaction of consumers contacted through the complaint investigation reacted very favorably toward the Department. Field investigations were not made of those complaints where it was found in the office that their services existed on dead-ends. Such complaints were handled by having the service immediately flushed, usually with favorable results.

MISCELLANEOUS INVESTIGATIONS

Special studies and investigations were given to the following matters:

1. DEVELOPMENT AND IMPROVEMENT OF LABORATORY PROCEDURE. Special studies were made on the application of a steam distillation procedure for the separation of fluorides from interfering substances prior to their determination by the colorimetric procedure developed at this laboratory in 1933. An investigation of nitrogen recoveries from solutions containing known amounts of pure amino acids resulted in the modification of the former methods of analysis to increase the accuracy of the test. A turbidimetric procedure for the rapid determination of sulphates in concentrations smaller than 25 p.p.m. was adopted for use in partial mineral analyses. Turbidity standards prepared with reservoir silt were devised to replace those made with standard silica suspensions in order to facilitate the comparison of standards with the samples. A procedure for the determination of chlorine demand of water was developed.

2. SPECIAL PROBLEMS IN WATER SYSTEM CONTROL AND MAINTENANCE. The intensive late winter and early spring boron studies initiated last year were continued. The timely diversion of sixty-five tons of boron from Owens River water resulted in a reduction of the irrigation season boron peak in San Fernando Valley from

an estimated 1.5 p.p.m. to an average of 0.60 p.p.m. A twenty-four hour survey was made to determine the daily fluctuations of Aqueduct and Los Angeles River water within the mixed water zones in the City proper. Routine determinations of the aluminum staining properties of water were made on all samples brought into the laboratory for complete mineral analysis.

3. COOPERATIVE ACTIVITIES WITH OTHER DIVISIONS OF THE DEPARTMENT. Elaborate analyses were made on gas and water samples collected from Mono Craters Tunnels. In addition, considerable assistance was also rendered in the selection of equipment and furnishing of chemicals used for gas and water analyses. Analyses of soluble soil salts were made on samples submitted by the Electrolysis Division. The periodic examination of samples furnished by the Underground Water Development Division in connection with studies of sea water intrusion were continued during the past year. A considerable number of rapid sanitary chemical determinations were made on waters collected by the Meter and Service Division for its guidance in repair work. The chemical examination of samples from construction camps in the Boulder Transmission Line was continued this year.

4. CONSULTING SERVICE TO WATER USERS. During the past year this laboratory continued to offer information and advice on many problems involving water quality submitted by individuals, as well as commercial and industrial establishments. These included development of colored pictures at motion picture studios, electroplating, brewery, soda water bottling, and many other processes. A study was also made to determine whether or not activated clays in reservoirs would be of any assistance in keeping down algal growths. So far the results have not been satisfactory.

Mono Craters Tunnel

HUGH MULHOLLAND, *General Foreman*

THE Mono Craters Tunnel has a total length of 59,811.7 feet from portal to portal, 24,446.59 feet from West Portal to Shaft No. 1, 22,629.91 feet between Shaft No. 1 and Shaft No. 2 and 12,736.20 feet from Shaft No. 2 to East Portal. The tunnel section is 9′0″ in height and 9′7½″ wide, of the wide horseshoe type, and has a cross-sectional area of 72.3 square feet inside the concrete lining. On account of very heavy ground encountered as the tunnel progressed, it was found advisable to modify the shape of the concrete lined portion from the horseshoe section to one practically circular in those sections.

Excavation work at West Portal began on September 22, 1934, and at East Portal on November 23, 1934, using hand equipment only. Use of mechanical equipment, consisting of drill carriages, mucking machines, electric locomotives, and muck cars was started in February, 1935, and the progress of the excavation work was greatly accelerated. The sinking of Shaft No. 2, including the excavation for the muck pocket and surveyors' drift, was finished in October, 1935, and drifting in Heading No. 4, westerly from the shaft, and in Heading No. 5, easterly toward East Portal, began immediately.

TUNNEL EXCAVATION—HEADING NO. 1 (WEST PORTAL)

A total of 8,502 feet of tunnel was excavated during the fiscal year ending June 30, 1936, of which 929.5 feet was supported. Carbon dioxide gas in small quantities was first encountered approximately 7,900 feet from

the portal. A second gas area was met at about 11,000 feet, near Test Hole 3 J, and the third area when 12,500 feet from the portal. The presence of this gas necessitated sinking Shaft No. 3, which was located at Test Hole 3 J. This shaft, to be used for ventilation of the tunnel and as an exit for water encountered beyond, is 5 feet by 10 feet in size and 535.5 feet in depth to tunnel grade. After installing blowers and air pipe in the shaft, it is expected that the gaseous condition will be sufficiently relieved to permit the resumption of work at the face. The sinking of this shaft was begun on May 16, and finished on June 30, the work being carried on both from the top and bottom of the shaft.

A small flow of water was encountered on August 19, 1935, approximately 7,000 feet from West Portal. The amount of water since the middle of October has varied from 2,500 gallons per minute to 4,500 gallons per minute on June 30, reaching a maximum flow of 5,521 gallons per minute on May 27.

Tunnel Excavation—Heading No. 4 (West Heading from Shaft No. 2)

Begun in October, 1935, a total of 4,616.0 feet of tunnel was excavated in this heading to July 1, 1936, of which 3,639.5 feet was supported. Considerable water has been met throughout the drilling of this heading, but it has not seriously retarded the work. Excavation progress ceased from February 17, 1936, to March 6, because of water encountered in Heading No. 5 which flooded Headings No. 4 and 5 and Shaft No. 2.

Tunnel Excavation—Heading No. 5 (East Heading from Shaft No. 2)

Since October, 1935, when work started, a total of 2,669.5 feet has been excavated, including 2,315 feet of supported ground. On February 17, 1936, a pocket of water, approximately 4,000,000 gallons, was encountered about 1,325 feet from Shaft No. 2, which flooded both Headings No. 4 and 5 and rose about 200 feet in Shaft No. 2 within 91 feet of the collar. When work was resumed on March 25, it was found necessary to replace support over a considerable portion of this heading.

Tunnel Excavation—Heading No. 6 (East Portal)

During the fiscal year 1935-1936, 6,053 lineal feet was excavated in this heading, of which 3,079.8 feet was supported. Swelling ground, necessitating extra heavy timber support, and some areas of quicksand were encountered which retarded the progress to some extent. The flow of water varied from about 1,300 to 2,000 gallons per minute throughout the year.

Timber and Steel Support

It was found necessary, due to the heavy formation in different portions of the tunnel, to use heavier support than the 8″x8″ timber sets called for in the original plans. In some cases, 14″x14″ timber sets replaced the standard size sets, while in other cases 5″ "I" beams, 6″ "I" beams, or 6″ "H" beams were used. When exceptionally heavy ground was encountered, it became necessary to weld two 5″ "I" beams together side by side, pour concrete between the two beams, and then place the double beams outside of 14″x14″ timber sets, 415 feet of tunnel being supported in this manner. The supports, either timber or steel, were usually spaced 5′0″ center to center, although in some portions of the tunnel they were placed on 2′6″ centers. The following table gives the number of sets of special support used in the four headings during the past fiscal year:

5″ "I" beams	2,117 sets
6″ "I" beams	478 sets
6″ "H" beams	716 sets
14″x14″ timber	11 sets
14″x14″ timber inside double 5″ "I" beams	32 sets

Shaft Sinking—Shaft No. 1

Shaft No. 1 has been difficult to sink because of fine, running sand, and varying quantities of water under high pressure. During the year a total of 224 feet of shaft was excavated and timbered throughout up to February 21, 1936, when, due to these adverse conditions, work was finally suspended. Since that date, drifts have been excavated at different levels in an effort to intercept the water and running sand. This work has been successful, for we now have the water and sand under control and it is estimated that the shaft will be sunk to tunnel grade by about the latter part of April or the first part of May, 1937.

Shaft Sinking—Shaft No. 2

This shaft, 359 feet deep, was completed on July 9, 1935, to the bottom of the muck pocket, 18.5 feet being excavated since July 1. Excavation for the transformer station, battery charging station, pump station, and surveyors' drift were completed early in October, 1935, when excavation work was started in Headings No. 4 and No. 5.

SUMMATION OF TUNNEL PROGRESS:

MONTHLY PROGRESS
EACH HEADING
Feet

Month	Heading No. 1	Heading No. 4	Heading No. 5	Heading No. 6	Total
1935					
July	1,230.0	.....	.....	460.0	1,690.0
August	975.0	.....	.....	745.0	1,720.0
September	467.0	.....	.....	925.0	1,392.0
October	240.0	210.5	272.5	757.3	1,480.3
November	521.0	536.0	371.0	918.0	2,346.0
December	864.0	566.0	263.0	407.7	2,100.7
1936					
January	988.0	331.5	231.0	437.0	1,987.5
February	1,043.0	181.5	188.0	294.0	1,706.5
March	1,120.0	634.5	30.0	360.8	2,145.3
April	810.0	780.0	483.0	126.2	2,199.2
May	244.0	553.0	476.0	277.0	1,550.0
June	No Work	823.0	355.0	345.0	1,523.0
Total	8,502.0	4,616.0	2,669.5	6,053.0	21,840.5

TOTAL TUNNEL PROGRESS TO JULY 1, 1936

	Distance Feet	Distance Excavated Feet	Per Cent Excavated
Heading No. 1 to Shaft No. 1	24,446.59	13,561.0	55
Shaft No. 1 to Shaft No. 2	22,629.91	4,616.5	20
Shaft No. 2 to Heading No. 6	12,735.20	12,512.2	98
Total	59,811.70	30,689.7	51

	Date Started	Distance Excavated Feet	Number of Shifts	Average per Shift Feet	Number of Working Days	Average per Working Day Feet
*Heading No. 1	Feb. 1935	12,898.4	1242	10.39	441	29.25
Heading No. 4	Oct. 1935	4,616.5	677½	6.81	249	18.54
Heading No. 5	Oct. 1935	2,669.5	592½	4.51	237	11.26
*Heading No. 6	Feb. 1935	9,620.0	1372½	7.01	493	19.51
Heading Totals		29,804.4	3884½		1426	
Rate of Progress per Heading				7.67		20.99
Rate of Progress (Four Headings)				30.68		83.96
Shaft No. 1	Nov. 1934	763	1490	0.51	542	1.41
Shaft No. 2	Feb. 1935	362.5	290	1.25	132	2.75
**Shaft No. 3	May 16, 1936	535.5	222	2.41	81	6.61

*Progress subsequent to installation of mechanical equipment.

**Includes Shaft sinking and Shaft raising.

A total of 3,305 cubic yards of muck was removed from the four headings during the fiscal year.

Major Construction Division

H. L. JACQUES, *Engineer of Major Construction*

GRANT LAKE RESERVOIR

STANLEY DUNHAM, *General Construction Superintendent*

DURING the current fiscal year, the enlargement of Cain Ranch camp was completed, including the erection of one additional single-family residence, one commissary, and two bath houses. All the camp buildings were furnished with heating stoves fitted to burn fuel oil supplied from central overhead storage. This camp is now equipped to house and feed approximately 165 men.

At the dam site, a carpenter shop and a blacksmith shop were built and equipped. A pumping plant was installed and pipe lines laid to furnish water from Grant Lake for construction purposes at the dam site and at other points as needed.

The by-pass ditch was completed, to divert Rush creek during dam construction; total excavation 9,580 cu. yds. of which 6,650 cu. yds had been excavated during the previous fiscal year.

Because of the severe winter weather, stripping operations at the dam site were suspended in December, 1935, being resumed in April, 1936. At the close of the current fiscal year, a total of 334,120 cu. yds. had been excavated, of which 3,400 cu. yds. was excavated during the previous year. It is estimated that stripping operations were 90% completed at the end of the fiscal year.

The material removed in stripping was placed in a spoil bank for use later in the dam embankment, excepting 10,868 cu. yds. which was passed over and through a grizzly to screen out the large rocks. The finer material from the grizzly (7,200 cu. yds.) was placed in the central section of the dam embankment, the remainder being placed in the down-stream pervious section of the embankment.

Excavation was completed on the outlet tunnel from Grant Lake reservoir, length 3,412 ft., of which 3,401 ft. was driven from the East Portal. Work was begun in December, 1935, with the excavation of the East Portal approach cut, (5,000 cu. yds.), and the erection and equipment of a compressor house, blacksmith shop, and change house. The tunnel was holed through May 24, 1936. It was supported throughout with steel rib sets and timber lagging. Equipment has been assembled and installed for mixing and placing the concrete lining in the tunnel, and this work will soon be in progress.

Excavation was completed on the outlet valve control shaft, 78.3 ft. from shaft collar to tunnel grade. The concrete lining of this shaft is being carried down from the collar, 24.5 ft. having been concreted at the end of the fiscal year. The plug valve regulating the discharge from reservoir will be located in a concrete chamber at the foot of this shaft, the shaft providing access to the valve control mechanism.

Construction was well advanced on an earth ditch to divert water from the East Portal of the outlet tunnel back ino Rush creek, for irrigation purposes. Excavation from this ditch was 18,600 cu. yds. at the end of the fiscal year.

To provide sand and gravel for concrete work in connection with Grant Lake reservoir, and at other points on the Mono Basin Project, a portable crushing and screening plant was erected approximately ½ mile east of Cain Ranch camp, electric powered, output capacity 400 cu. yds. per 8-hour day. At the end of the fiscal year, approximately 7,000 cu. yds. of sand and gravel had been produced by this plant. The bulk of this output was hauled to the East Portal of Grant Lake outlet tunnel for concrete lining, the remainder having been used on Mono Craters Tunnel. The first gravel pit opened (at the plant site) proved unsatisfactory, yielding too much waste material. A more suitable deposit has been uncovered some 2¼ miles farther east, which now supplies the plant. In connection with the operation of this plant, it was necessary to construct 2 miles of road, and a 20-ton bridge across Rush creek.

LONG VALLEY RESERVOIR

S. L. PARRATT, *Assistant Civil Engineer*

The work of reconditioning the old camp buildings, and the erection of new buildings, was completed. A list of the existing buildings follows:

Construction progress on Mono Basin Project Dams: (Top) Grant Lake dam site, looking west; (Bottom) Long Valley dam site, looking upstream.

OLD BUILDINGS

1 Mess Hall, capacity 175 men
1 Mess Dormitory
1 Guest House, remodeled and enlarged
1 Office, remodeled and enlarged
1 Garage, remodeled and welding shop added
1 Warehouse, repaired and remodeled
1 Plumbing Shop, remodeled
2 Dormitories, total capacity 95 men, repaired and remodeled

NEW BUILDINGS

6 Dormitories, total capacity 98 men
1 Storage Garage, with concrete pit
1 Carpenter Shop
1 Commissary
1 First Aid Station
1 Bath House
1 Electrical Shop
1 Compressor House
1 Blacksmith Shop
1 Tool-Doctor's Shop
1 Change House

The machinery and equipment necessary for construction purposes were installed in the various buildings.

The kitchen is equipped with an oil burning range, electric bake ovens, and electric refrigeration.

All buildings are lighted with electricity, and heated with wood and coal stoves.

Water for camp use is now obtained from a well (timbered and housed) approximately 100 yards below camp. From this well, water is pumped to two 6,000 gallon tanks on high ground to afford sufficient pressure throughout the camp. The tanks are housed and provided with heating units to prevent freezing. The distribution system comprises 1,402 ft. of 2″, and 215 ft. of 3½″ pipe.

Pyrene fire extinguishers are conveniently located in all buildings. Additional fire protection is provided by 2″ fire hose and nozzles on racks inside and outside of warehouses and dormitories, connected with 392 ft. of 2″ pipe lines for fire use only.

Latrines for general camp use have been enlarged and remodeled.

Sewage from inside flush toilets is discharged into an enlarged septic tank through 796 ft. of 4″, and 172 ft. of 6″ sewer pipe.

A road was constructed to the north abutment; length 1,350 ft., excavation 8,830 cu. yds. earth and rock.

Also a road was constructed to the south abutment; length 2,550 ft., excavation 22,200 cu. yds. earth and rock.

Two timber bridges were constructed across Owens river, one above and one below the dam site.

Water for construction uses, including hydraulic stripping, is pumped direct from Owens river by two pumps installed in the Compressor House. Pipe lines laid for this purpose comprise 5,175 ft. of 2″, 120 ft. of 3½″, and 1,700 ft. of 4″.

Compressed air for construction requirements is delivered through 220 ft. of 2″, and 4,070 ft. of 4″ pipe.

The repairing and remodeling of the rock and gravel plant was completed, including the erection of a new hoist house. The output of this plant during the fiscal year was 19,833 cu. yds., which was used in the various concreting operations.

The work of trimming, regrading, and concrete lining the Outlet Tunnel and Adit No. 1 was completed.

Tunnel trimming	3,125 lin. ft.
Tunnel regrading	5,550 lin. ft.
Concreting, sides and arch	3,126 lin. ft.
Concreting, invert	6,433 lin. ft.
Adit trimming	650 lin. ft.
Adit regrading	739 lin. ft.
Concreting, sides and arch	644 lin. ft.
Concreting, invert	739 lin. ft.

A transition section, length 127 ft., was constructed of reinforced concrete, connecting the diversion canal with outlet tunnel; excavation 1,160 cu. yds. of earth.

Stripping operations at dam site No. 1 disclosed unfavorable conditions, and operations there were suspended September 10, 1935, after the removal of 81,479 cu. yds. of earth and rock.

Stripping operations were begun immediately at dam site No. 2, some 2,000 ft. upstream. At the end of the fiscal year, 372,800 cu. yds. of earth and rock had been removed at site No. 2, which is estimated to be 70% of the total stripping required.

Dewatering operations required the installation of 10 pumps, with 350 ft. of 2″, 700 ft. of 4″, and 730 ft. of 6″ pipe.

For exploration purposes two Calyx drill holes were put down at site No. 2. Drill logs of these holes are on file; Hole No. 3-D, 178 ft. deep, Hole No. 4-D, 180 ft. deep.

A test shaft 3 ft. by 5 ft. was sunk to a depth of 45 ft. on the north bank of Owens river near the upstream toe of dam.

Also a test drift, length 36.5 ft., was driven into the north abutment, 110 ft. northwest of the axis.

A trench is under excavation for a cut-off wall near the upstream toe of dam, 182 cu. yds. having been excavated. Grouting is in progress along this trench; to date 40 holes have been drilled and grouted, average depth 20.6 ft. Grouting is by gravity pressure from a tank some 50 ft. above.

Excavation is under way on the Spillway and Diversion Tunnel, 524 ft. having been driven to date. The tunnel is supported where required by steel or timber sets on 5 ft. centers, with timber lagging.

From the East Portal approach cut to this tunnel, 6,630 cu. yds. of earth and rock were excavated.

From the spillway forebay, 5,800 cu. yds. of rock have been excavated.

A granite mountain in Little Round Valley was explored to ascertain if suitable rock could be obtained there for the construction of Long Valley dam. Four benches were quarried out and 15 drifts driven; excavation 1,179 cu. yds. Also the area on the north side of the mountain was explored by 10 surface shots. Suitable material for the construction of a rock-fill dam was not found.

Field Engineering and Design

R. R. PROCTOR, *Engineer in Charge*

FIELD ENGINEERING

THE duties of the Field Engineering Division for the past year were as follows: Engineering Supervision and Inspection of Construction; all surveys that were required of the Bureau of Water Works and Supply south of Haiwee Reservoir; the operation of the Field Engineering Laboratory; and miscellaneous Field and Office investigations to obtain data for the operation of the system and for the design of new units.

ENGINEERING SUPERVISION AND INSPECTION OF CONSTRUCTION

Engineering supervision and inspection was maintained, during the paving and curb construction on the road around Hollywood Reservoir, during the reconstruction of the Upper San Fernando Spillway, during the fabrication, enameling, and installation of the steel pipe for the Harbor District Trunk Line, during the excavation of the Mono Craters Tunnel and shafts, and at Long Valley and Grant Lake damsites. This consisted of a continuous engineering inspection of the work as it progressed to insure compliance with prepared plans or that necessary changes in plans were made and approved. Complete records were kept of the manner in which the work was performed, including the taking of many progress photographs. Physical and chemical tests, necessary to determine the quality of the completed work, were made.

During the fabrication of the welded steel pipe for the Harbor District Trunk Line, engineering supervision was continued at the steel plant and in the field, including the inspection of the quality of the steel plate and the welding procedure used to manufacture the pipe.

Preliminary investigations at Long Valley and Grant Lake dams included the inspection and testing of foundation materials, the location of borrowpits, and sand and gravel pits, the selection of representative samples from the pits to be tested for suitability as fill material and concrete aggregate, and assisting engineer in making estimates, planning construction methods, locating roads, and keeping the necessary records for regular progress reports. Field laboratories were established at the two dams, and proper equipment installed, to enable the inspectors to make immediate suitability tests of all construction materials.

Engineering inspectors were furnished during the fabricating and loading of steel tunnel sets, drive pipe and ventilating pipe for Mono Craters Tunnel. A gas analysis apparatus was obtained and daily tests of air and water were made in the West Portal Heading of the tunnel.

FIELD SURVEYS

Throughout the year five survey parties were used, accomplishing the following work: Surveys were made for the installation of pipe lines and fire hydrants; topographic maps were prepared of Department property; Department dams and steel tanks were checked monthly for settlement or position change; a retracement survey of alignment, interior cross-section, and profile was made in the Stone Canyon inlet tunnel; levels were run to wells in various sections, to aid in underground studies; several parcels of Department property were surveyed, and permanent monuments were established at corners; surveys were made at location of accidents involving Department cars; surveys were made during the construction of the road around Hollywood Reservoir, the Harbor District Trunk Line, and the Upper San Fernando Spillway.

FIELD ENGINEERING LABORATORY

SOIL AND CONCRETE SECTION

Investigations of construction materials, for Mono Craters Tunnel and Grant Lake and Long Valley Dams, were continued throughout the year. Freezing and thawing tests were conducted on mortar samples made from sands from Long Valley and Mono Basin. Compaction and percolation-consolidation tests were made of soil samples from proposed borrowpits and abutments of Grant Lake Dam. Sieve analyses, absorption tests, and chemical analyses were made of samples of aggregates from proposed pits in Long Valley and Mono Basin.

Mortar control tests were made using different brands of cement. Concrete yield tests, compression tests and mortar plasticity tests were made using Mono Basin sands and several brands of cement. Samples of reinforcing bars to be used in the Grant Lake Tunnel were tested. All of above tests were made to supply data to the design and construction engineers to control the proper selection of construction materials.

Miscellaneous soil research tests were conducted, and improvements to equipment were made. Samples of cast iron to be used for manhole covers were tested. Tension tests were made of brass and bronze samples taken from material to be used in fabricating fire plugs.

PROTECTIVE COATING SECTION

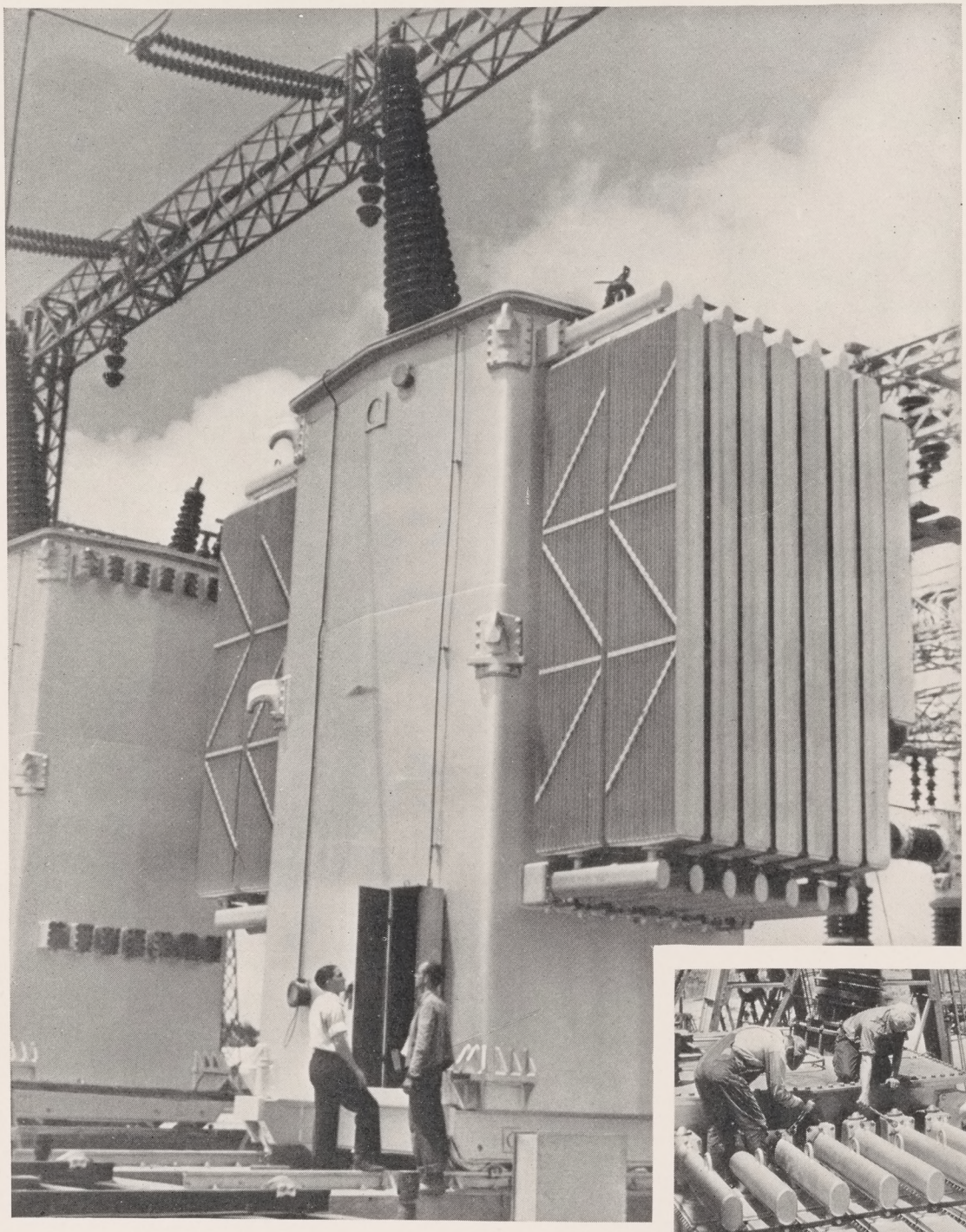
The installation of the Harbor District Trunk Line was completed during the year. Continuous inspection and supervision of the application of the coating material in the pipe yard and in the field was maintained. A preliminary soil survey was made of the route to be followed by the Stone Canyon-Western Avenue Trunk Line to determine the corrosivity of the soil and its mechanical strength to rupture protective coatings, and specifications were written for the purchase of the coating.

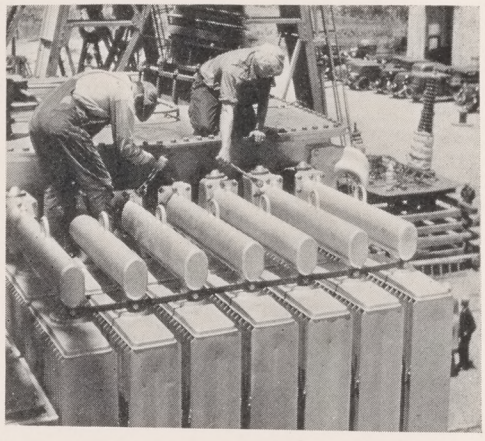
Department steel tanks, to be repainted, were inspected and a report was written regarding type of paint to be used and method of application, also inspection was maintained during the actual painting.

Durability and water-proofing tests were made of samples of stucco paints. A series of experiments were made to produce a more suitable whitewash for enameled pipe. Numerous paint samples, submitted on bids for various jobs were tested and recommendations were made as to awards. Inspectors were supplied to assist in supervision of application. A test apparatus was designed and constructed for accelerated tests of the moisture resistant properties of protecive coatings.

MISCELLANEOUS ACTIVITIES

Water level indicators and test wells were measured regularly at Chatsworth, Upper Hollywood, and Bouquet Dams. The interior of the San Fernando by-pass conduit from Upper San Fernando outlet tower to the Chatsworth conduit was inspected and a report written regarding the condition of the lining. Seepage measurements at Ascot Reservoir were continued. The interior of the McClay conduit was inspected. Survey field books were indexed and photostated, engineering articles of interest were read and copies were filed for future reference.





Larger electrically and physically than any previously built are the autotransformers which will lower the Boulder Canyon Power Transmission Line receiving end voltage from 275,000 to 132,000 volts. They are installed at Receiving Station "B" of the municipal Bureau of Power and Light.

Bureau of Power and Light

E. F. SCATTERGOOD
Chief Electrical Engineer and General Manager
VELMA C. TUTTLE, *Secretary*

July 1, 1936

TO THE HONORABLE,
THE BOARD OF WATER AND POWER COMMISSIONERS,
BUILDING.

GENTLEMEN:

The matter of greatest interest in the affairs of the Bureau of Power and Light during the past year has been the prospect of the early receipt by the City of Los Angeles of electrical energy from the power plant under construction by the Bureau of Reclamation of the United States Government at Boulder Dam. The construction of the dam, as is generally known, is completed and the work on Boulder Power Plant is well advanced. During the entire period of construction, of both the dam and the power plant, engineers of the Bureau of Power and Light have cooperated with the engineers of the Bureau of Reclamation in every way possible, looking to a completion of the whole project at the earliest possible date. It now seems likely that the generation of elecrical energy at Boulder Power Plant will begin some time during the month of October and with its reception into the system of the Bureau of Power and Light, the long and persistent efforts which have been made during the past sixteen years, with this end in view, will be brought to fruition, and the hopes and expectations of the citizens of Los Angeles who are so vitally interested in the enterprise will be realized.

The transmission line which is being built to transmit power from Boulder Power Plant to Los Angeles is nearing completion and will be ready for use well in advance of the beginning of the operation of the Power Plant.

LOAD AND BUSINESS DEVELOPMENT

Because of a substantial increase in the average flow in the Aqueduct from 258.5 second feet for the year 1934-35 to 325.8 second feet for the year just closed, the total electrical energy generated in the city's plants was 299,749,100 kwh. which represents an increase of 27.4% over that for the previous year. The total demand on the system was 822,723,307 kwh. which is 10.6% greater than that for the year 1934-35.

Notwithstanding the approximate 10% reduction in electric rates made effective February 1, 1936, there was an increase in gross revenues for the year of 3.8%. The average annual consumer use was 658 kwh. which is 56 kwh. greater than that for the year preceding. With the load building program well under way in the Business Agent's Division, which program consists of efforts to promote the sale and use of domestic appliances and to extend the use of electrical energy for all purposes in the commercial and industrial field, this average consumer use should show a marked increase for the coming year.

The net gain during the year in the number of meters in service was 2302.

The records of both the Operating and Distribution Division and the Business Agent's Division bear evidence of a decided improvement in commercial and industrial conditions in Los Angeles. During the year, 2934 applications for services for all classes of commercial and industrial purposes were received which represent a total increased load of 18,700 kw. and an estimated revenue of over $300,000.

SYSTEM EXTENSIONS AND BETTERMENTS

In the reports of the Operating and Distribution Division and the Design and Construction Division will be found data pertaining to additions and betterments made during the year to both the overhead and underground distribution systems, to Power Plants, to Receiving and Distributing Stations and reference to the building of two new Distributing Stations, one of which is in the Eagle Rock District and one at Pacific Palisades.

BOULDER CANYON POWER TRANSMISSION LINE

As stated above, construction of the transmission line is nearing completion. On June 30, 1100 men were employed on the work. Two thousand, six hundred seventy-eight steel towers or approximately 99% of the total number have been erected; the laying of counterpoise wire is approximately 98% complete; the stringing of ground wire 86% complete and that of the conductor 98.6% complete. Insulation units numbering 9905, which is 99% of the whole, have been installed.

FREQUENCY CHANGE

Much attention has been given by all Divisions of the Bureau and the General Plant Division to the contemplated standardization of frequency and delivered voltage in the system of the Bureau of Power and Light which are to be made with the advent of Boulder Canyon power. The frequency will be changed from 50 to 60 cycles per second and the voltage from approximately 115 volts to 120 volts, thus decreasing the costs of rendering service and enabling consumers to purchase standard electrical equipment.

As will be noted in the reports of the several Divisions, the preliminary or preparatory work is well in hand and there is every reason to believe that the changes will be made gradually by districts throughout the city, without expense or inconvenience to consumers.

POWER REVENUE BONDS

At an election held October 29, 1935, the citizens of Los Angeles approved by a majority of more than four to one the issuance of Power Revenue Bonds in the sum of $22,799,000, to be used for the repayment of the loan for that amount negotiated in 1933 with the Reconstruction Finance Corporation for use in the building of Boulder Canyon Power Transmission Line and Receiving Stations. The bonds so voted were sold without difficulty at an interest rate of 4% and a premium of one per cent.

The purpose of this refunding plan was to comply with an understanding had with the Reconstruction Finance Corporation at the time the loan was obtained that an effort would be made to do this; to effect a lower rate of interest; and to extend the period of time over which the bonded indebtedness must be paid.

ACQUISITION OF ELECTRIC SYSTEM OF LOS ANGELES GAS AND ELECTRIC CORPORATION

Pursuant to authority granted in a charter amendment voted by the people of Los Angeles on September 27, 1934, negotiations were begun during the year for the purchase of the complete electric generation, transmission and distribution system of the Los Angeles Gas and Electric Corporation. Such negotiations are progressing satisfactorily and the prospect now seems favorable for an early consummation of such purchase.

This contemplated purchase is a part of the plans formulated more than 25 years ago for the distribution of electrical energy to be developed in connection with the Los Angeles Owens River Aqueduct which the people of Los Angeles decided, by vote, should be accomplished by the city.

PRICE, WATERHOUSE & COMPANY REPORT

The customary annual audit report of Price, Waterhouse & Company on the books and accounts of the Bureau of Power and Light for the fiscal year ending June 30, 1936, shows a net income or earned surplus for the year of $4,220,374.63, which amount is nearly $160,000.00 greater than that for the preceding year. This is the net earnings after deducting all operating and maintenance expense, full allowance for depreciation reserve and interest on bonded indebtedness.

JOINT DIVISIONS

The work of the several Joint Divisions during the past year has been of great importance particularly to the major construction enterprises of the two Bureaus, that is the construction of Boulder Canyon Power Transmission Line by the Power Bureau and the construction work being carried on in Mono Basin and Long Valley by the Water Bureau. The transportation problem alone, which is included in the duties of the General Plant Division, is one of great magnitude and has been well handled. The total car mileage run by all vehicles during the year was 15,438,301 miles and the total tonnage transported amounted to 3,510,769 tons.

The work of the Purchasing Division has been of great volume because of the large number of small purchases necessary in connection with frequency change activities and the magnitude of the two major construction projects referred to above. Such work has been carried on satisfactorily. The total amount of all purchases was $8,609,256.43.

The work of the Commercial Division is set forth in tabular data relating to the work of meter reading, the collection of bills, the maintenance of consumers' accounts, the handling of mail and much other similar work, all of which has had most efficient attention.

The Right of Way and Land Division has rendered efficient service in obtaining necessary right of ways for the transmission line and for other purposes of the two Bureaus and such work, with mention of the many other duties of that Division, is well presented in its portion of the Annual Report.

These Joint Division reports are included with those of the Bureau of Power and Light because of the action of your Board in placing the Chief Electrical Engineer and General Manager in managerial control of all Joint Divisions.

EMPLOYMENT RELIEF, TAX RELIEF AND DIRECT RELIEF

During the year there was transferred from the Power Revenue Fund to the General Fund and the Reserve Fund in the City Treasury, by action of your Board and on recommendation of the Chief Electrical Engineer and General Manager, the sum of $1,250,000.00. Of this amount approximately $750,000.00 was made available for tax relief and assistance in balancing the City Budget; approximately $425,000.00 for Community Chest uses and other relief work and the remainder for miscellaneous purposes. This makes a total of all such transfers of $7,400,196.78 which is $1,558,000.00 in excess of all tax funds used, in the early days, on behalf of the Power Bureau.

Respectfully submitted,

E. F. SCATTERGOOD,
Chief Electrical Engineer
and General Manager.

Division of Operation and Distribution

T. A. PANTER, *Electrical Engineer in Charge*

AN indication of an increased rate of return to normal business conditions is shown by the very large increase in demand for electrical energy during the past fiscal year. Based upon present conditions, the prospects for the coming fiscal year look even brighter. While the bringing in of Boulder Canyon Power has been delayed until the coming fiscal year, the increased available aqueduct water supply has made it possible to generate the major portion of the increase in demand by means of the Bureau's own hydro electric plants, leaving only a small percentage of increase in the power purchased.

POWER SUPPLY AND DEMAND

The rapid increase in use of electrical energy from the Bureau's electrical system is indicated by the total demand for the year amounting to 822,732,307 kilowatt-hours and a peak demand of 183,200 kilowatts, an increase of 10.6% and 6.9% respectively over the preceding fiscal year. Of the above total demand the Bureau's hydro plants, due to increased amount of water available, generated a total of 299,749,100 kilowatt-hours, an increase of 27.4%, the average flow through Power Plant No. 1 being 325.8 second feet.

The marked increase in generation by the City's hydro plants made it necessary to purchase only 548,398,483 kilowatt-hours with a maximum billing peak of 85,200 kilowatts, or an increase of 3.8% and 4.9% respectively.

General detailed statistics as to production, purchased energy and distributed energy of the Bureau's electrical system during the past fiscal year are shown on the tabulation "Exhibit A". The same statistics showing the growth of the system from 1922-23 to 1935-36, inclusive, are shown on curve sheets "Exhibit B" and "Exhibit C".

DISTRIBUTION

As far as possible, the program of unemployment relief has been continued in our underground construction. Marked headway has also been made in the laying of high voltage conduits and cables between our local distributing stations and the removal of 33,000 volt overhead lines.

The program of replacing overhead low voltage feeder lines in congested areas and from distributing stations to load centers by underground service, in order to reduce the hazards to service where a large number of feeders are installed on the same pole line, is rapidly nearing completion to the point of that necessary for normal expansion of the system.

During the latter half of the fiscal year the rapid increase in new building, both commercial and residential, has made a marked increase in the work of the overhead and underground sections, at times making it difficult for our organization to keep up with the demand. Present indications show no signs of a material reduction in such building program.

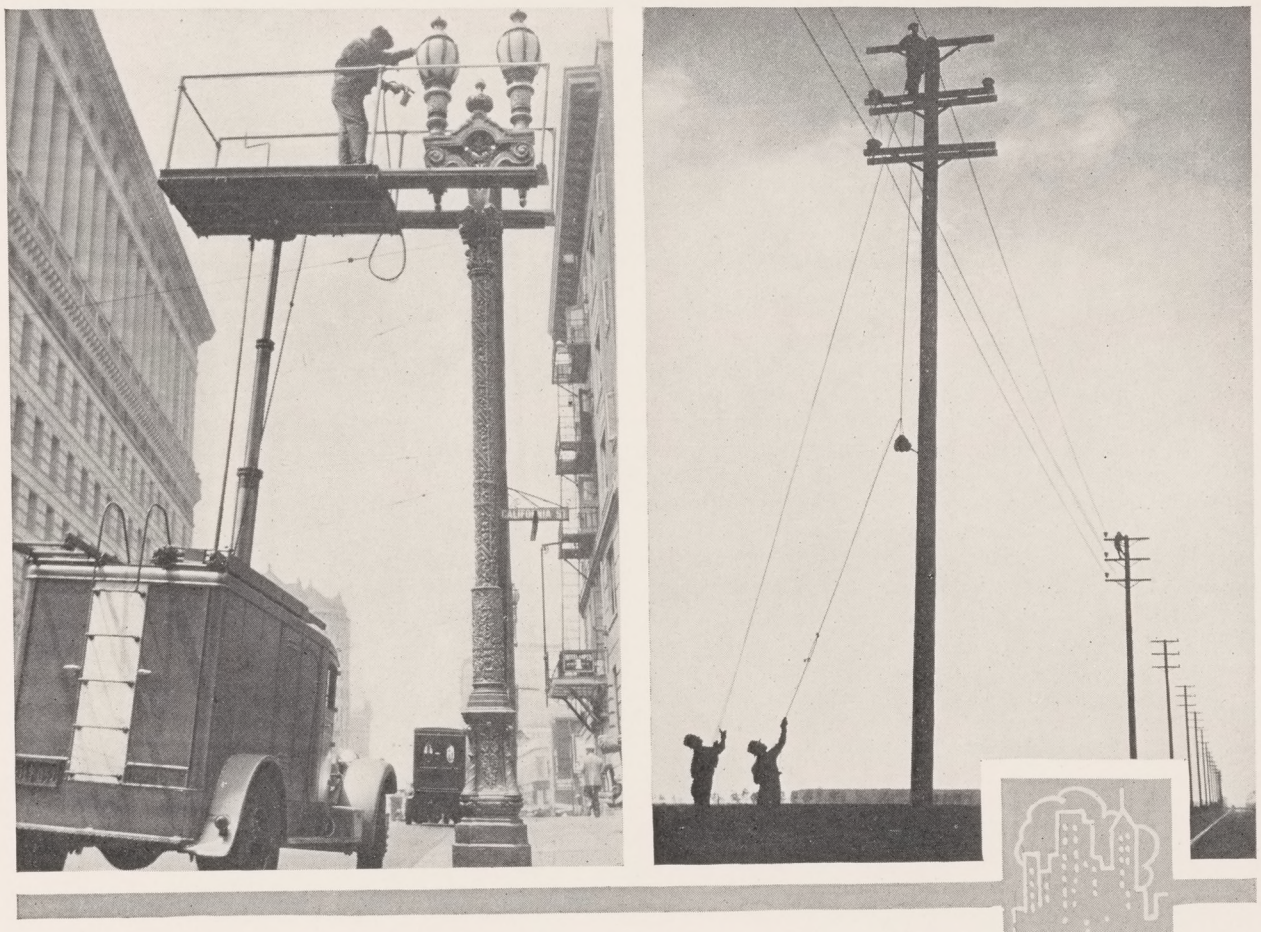
SERVICE

It is with a feeling of pride that we are able to report the following splendid service record, both in production and over the general system, and of material benefit to our consumers.

The generation of energy in our own hydro electric plants was accomplished without a single interruption during the present year and the same record applies to service over 110,000 and 132,000 volt transmission lines.

On our 33,000 volt and lower voltage distribution lines, protected by 2,781 protective relays in service, 372 operations of these relays were necessary due to electrical disturbances. All operations were successful in instantaneously segregating the portion of the system in trouble without jeopardizing the service of the consumers with the exception of one case; this means an efficiency in operation of 99.7%, a record which has been equaled by very few utility companies.

Due to the program of speeding up the isolation of portions of the system in trouble, as a general average we have decreased the time of clearing such troubles approximately 23% with its material benefit, particularly to industrial consumers having low voltage releases as protection. This work and the cooperation of such industrial consumers indicate that 85% of such operations have been within one second, another record of which the Department may be proud.



(Left) Servicing ornamental street lights from platform of specially built extension tower truck. (Right) Overhead construction scene.

The record of service as indicated above could only be obtained by the full cooperation of those connected with the work, and it is a pleasure and a privilege at this time to express our deep appreciation for the loyalty and efficient service of each member of the Operating and Distribution Division and the Test Section of the Design and Construction Division, to whom the credit for such an excellent record is due.

ADDITIONS AND BETTERMENTS TO THE SYSTEM

General

During the year a large number of tests were made to determine the adaptation of generation and station equipment for 60 cycle operation together with numerous schedules in order to make the change of frequency in the various sections of the City with the least inconvenience to the consumers. In addition to these, several items of interest, under additions and betterments, pertaining to production, transmission and distribution are set forth below.

Generation

The old style poppet air inlet valves on penstocks at San Francisquito Power Plants Nos. 1 and 2 and San Fernando Power Plant have been replaced with the most modern type of air inlet and vacuum valves which will greatly reduce the tendency for high pressures under quick changes of load or when the necessity arises for emptying of penstocks.

In order to provide a more flexible and reliable operation at San Francisquito Power Plant No. 1 the west

110 KV line was moved from its previous location to the west section of the building. It was also necessary to install new 125 volt storage batteries at San Fernando Power Plant to replace the old ones worn out in service.

RECEIVING, DISTRIBUTING AND INDUSTRIAL STATIONS

In conformity with the program which was followed in previous years, and also to adapt the system for the change of frequency, numerous changes have been made.

At Receiving Station "A" in order to provide for additional capacity due to the closing of the tie line between Receiving Stations "A" and "B", together with the additional peak which may be obtained by means of the Bouquet Canyon Reservoir, the transformer capacity was increased from 96,000 to 111,000 kilovolt-amperes by replacing a 15,000 kilovolt-ampere bank by a new 30,000 kilovolt-ampere bank.

At Distributing Stations Nos. 8 and 19 new 125 volt storage batteries were installed to replace those worn out in service.

At Distributing Stations Nos. 22 and 24 supervisory control systems were placed in service for the better operation of these stations.

As a continuation of the program already in effect, twenty-two of the 4,600 volt feeder regulators at Distributing Stations Nos. 1, 3, 8, 12, 13, 18 and 25 were rebuilt in the Electrical Repair Shop. It is anticipated that the additional short circuit capacity will prove of extreme value in the case of trouble on the feeders themselves or on the system proper, and that those which were increased in capacity from 66 kilovolt-amperes to 72 kilovolt-amperes will obviate the necessity for new regulators.

Numerous improvements in the relay protective devices on the system, such as the removal of obsolete relays and their replacement by more modern and reliable types, together with certain changes made in the connection of relays, have been of material benefit in decreasing the fault clearance time approximately 50%. High speed relays were installed on the 132 KV busses at Receiving Stations "B" and "C" as well as on both of the 132 KV transmission lines. In preparation for incoming Boulder Power thirty-six 33 KV switches having higher ratings have been installed in several of the important distributing stations and the lower duty switches have been placed in locations of less hazards, such as industrial stations on consumers' premises.

Distributing Station No. 38-A, having a capacity of 300 kilovolt-amperes, has been replaced by Distributing Station No. 38 with a capacity of 600 kilovolt-amperes. Distributing Station No. 43 was installed at 5444 West Imperial Highway with 1,000 kilovolt-ampere capacity as a temporary installation while the permanent Distributing Station No. 43 is being completed which will have a capacity of 1,500 kilovolt-amperes. This station will be used by the various industries and activities at Mines Field, together with a residential area which it is anticipated will be built at that location. A new Distributing Station No. 49-A was installed at Mulholland Drive and Stone Canyon Road with a capacity of 225 kilovolt-amperes. Distributing Station No. 23-B at 120th and Vermont has been discontinued as it was found more advantageous to supply the load directly from Distributing Station No. 14 over a separate feeder.

During the year eleven new industrial stations were installed for power consumers, having a total capacity of 5300 kva. During the same period, eight of such stations having a total capacity of 3170 kva. were removed from service. At the end of the fiscal year, 85 industrial stations and 245 commercial stations were in service on the Bureau's system.

OVERHEAD 33,000 VOLT SYSTEM

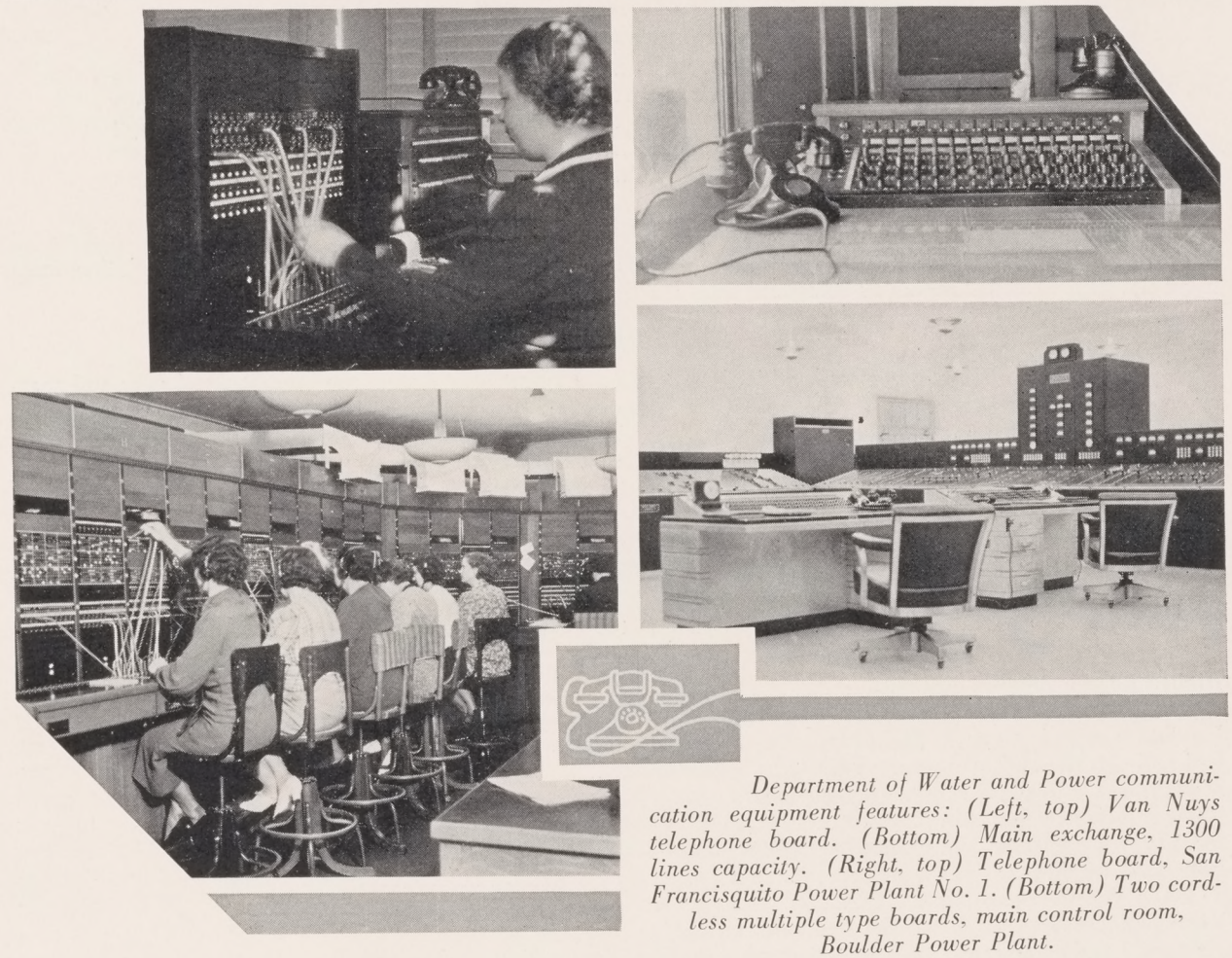
The construction of a double circuit line to feed the new Palisades Station resulted in a net increase of 13 miles of double circuit line, while the removal of single circuit trunk lines due to underground construction amounted to 11.04 miles. There was also a decrease of .3 miles of double circuit peddler lines but an increase of 3.75 miles of single circuit peddler lines. The total mileage of 33,000 volt lines in service at the end of the fiscal year amounts to 478.86.

OVERHEAD LOW VOLTAGE SYSTEM

The building program referred to above and occurring principally in the latter half of the fiscal year has resulted in a large increase in the number of line extensions, so that there was a net gain of 546 transformers having a capacity of 10,184½ kilovolt-amperes as compared with the addition of 409 transformers with a capacity of 8,307 kilovolt-amperes for the preceding fiscal year. Minor replacement jobs, totaling 599, and authorizations covering the removing of poles because of street improvements and new buildings, totaling 69, were handled as against 508 and 46 respectively for the preceding fiscal year. New poles, of which 1162 were replacements, total 3162, and 538 poles were removed, making a gain of 1462 poles for the year as against 1,290 poles for last year.

UNDERGROUND 33,000 VOLT SYSTEM

While the program of placing 33,000 volt lines underground has not progessed as rapidly as in the preceding fiscal years, yet material gain was made and 87,117 duct feet of conduit, 43,575 duct feet of conduit for



Department of Water and Power communication equipment features: (Left, top) Van Nuys telephone board. (Bottom) Main exchange, 1300 lines capacity. (Right, top) Telephone board, San Francisquito Power Plant No. 1. (Bottom) Two cordless multiple type boards, main control room, Boulder Power Plant.

control cable, 61 manholes and 16,271 feet of 33,000 volt, three-conductor, lead covered cable were installed. During the year, however, 3,423 feet of 33,000 volt cable was removed, or a net gain in lead covered cable of 12,848 feet for the year.

UNDERGROUND LOW VOLTAGE SYSTEM

During the year, 169,018 duct feet of conduit, 78 manholes and 15 vaults were installed. Transformers, totaling 91, having a capacity of 3,082 kilovolt-amperes, were installed, while 66 transformers, having a capacity of 1,829 kilovolt-amperes, were removed, the net gain in capacity being 1,253 kilovolt-amperes as compared with 221 kilovolt-amperes capacity decrease for the previous fiscal year. Detailed information as to the amount of cable installed, removed and net gain, is shown in the following tabulation:

	No. Feet Installed	No. Feet Removed	No. Feet Net Gain
Primary in Commercial Districts	46,506	3,423	43,083
Primary in Residential Districts	6,187	1,436	4,751
Secondary in Commercial Districts	21,399	3,720	17,679
Secondary in Residential Districts	53,526	2,789	50,737
Services in Commercial Districts	83,419	15,146	68,273
Services in Residential Districts	125,742	7,727	118,015

STREET LIGHTING SYSTEM

During the year 91 street light authorizations were completed, adding the following lights to the system:

881 ornamental lights installed and 722 removed, making a net gain of 159; 123 overhead lights installed and 110 removed, resulting in a net gain of 13 lamps.

The total number of street lights in service throughout the system is as follows:

56,530 lamps	Ornamental lighting
3,064 lamps	Parks, tunnels, bridges, etc.
9,669 lamps	Municipal overhead system
3,256 lamps	Commercial overhead system
332 lamps	Broadway arc system

METERS

The number of new meters installed during the year totalled 14,797, while 12,495 were removed, thus making a net gain of 2,302 meters as compared with 1,575 meters for the last fiscal year.

MAINTENANCE

Only one item of importance under this classification was necessary during the present fiscal year and occasioned by mechanical failure in the 25,000 kilovolt-ampere synchronous condenser located at Receiving Station "A". This caused the removal from service of this equipment for approximately eight weeks as the repair and replacement of this failure proved a very difficult piece of work. It was finally completed in a most satisfactory manner for which much credit should be given to the Electrical Repair Section of the General Plant Division.

The general or minor maintenance program such as daily inspections, tests and regular overhauling of equipment has continued to show results in the continuity of service the Bureau has been able to render. A number of these items and their magnitude are indicated in the following comparable table between the fiscal year 1934-35 and the present fiscal year 1935-36, and also the increase caused by the growth of the system:

	1934-35	1935-36
High voltage insulators cleaned	250,504	287,427
Defective insulators detected and removed from lines before failure	361	202
Insulators replaced due to flashovers	72	88
Old and deteriorated insulators removed as hazardous	205	200
Miles traveled in patrolling telephone lines	6,134	8,778
Miles traveled in patrolling 132,000, 110,000 and 33,000 volt transmission lines	122,517	141,775
Steel towers inspected and checked for loose bolts—132 and 110 KV	359	573
Pole top switches inspected	366	420
Pole top switch operations	4,995	5,073
Kites removed from high tension lines and feeders	261	364
Industrial and commercial stations inspected, cleaned and operating mechanisms checked	330	325
Commercial stations inspected and cleaned semi-annually	228	238
Industrial stations inspected every two months and cleaned where necessary	78	87
Oil circuit breakers inspected, checked and repaired where necessary	214	158
Oil circuit breakers overhauled after relay actions—33,000 and 4400 volt	57	42
Oil circuit breakers receiving regular overhaul—33,000 and 4400 volt	719	342
Oil circuit breakers overhauled at Receiving Stations "B" and "C"	27	37
Disconnect switches overhauled at Receiving Stations "B" and "C"	148	120
Oil circuit breakers completely rebuilt—33,000 and 132,000 volt	12	22
Oil circuit breaker pallet switches inspected and relay action tested	415	420
Feeder regulators replaced for rebuild—G.E. F71 and F72	16	24
Insulation oil tests taken from station equipment representing a total of 2,121,270 gallons of oil for 1934-35 and 3,066,810 gallons for 1935-36	2,391	3,142
Station roofs inspected and repaired	38	37
Relays tested and repaired	2,964	3,035
Automatic relay operations	312	372
Water wheel needles and nozzles replaced	9	1
Clearances issued by Load Dispatcher's office—(Electrical and hydraulic)	10,942	11,451
Emergency calls answered by Trouble Dispatcher's office	89,214	98,693
Emergency calls answered by Line Patrol Section	1,183	1,515
Emergency calls answered by Maintenance Section	345	333

OWENS VALLEY SYSTEM

Little, if any, improvement has been shown in increase of load in the Owens Valley District and with the exception of the amount of power delivered to the Southern Sierras Power Company under contract from the Adams Main and Adams Auxiliary Power Plants, the service remains the same.

With the increased amount of water available, if the power could have been utilized the Department would have been able to have decreased its purchased energy by approximately 48,000,000 kilowatt-hours.

COMMUNICATION

The marked increase in business conditions, together with the demands from the frequency change and the Mono Basin construction have necessitated material changes in our communication system as indicated by the major items below:

MAIN OFFICE—LOS ANGELES

The Department's main telephone exchange at this location was increased in capacity from 1,100 lines to 1,300 lines. As a result of the preliminary installation of teletypes between the Purchasing Division and the Stores Section, which proved conclusively the great savings in time and labor as well as rapidity in the service resulted, six Department-owned teletypes were installed between these two locations.

SAN FERNANDO VALLEY

In the San Fernando Valley new common battery telephones, switchboard, test board, one additional Department teletype and automatic dial teletype switching equipment were installed at Van Nuys; in addition, loading coils were installed in the Department's telephone cable as far as Hollywood; — all of which have greatly improved telephone communication, the handling of consumers' requests in the branch office in the Valley and the transmission of telephone calls between the Valley and the main office in Los Angeles.

MONO BASIN

The telephone system was extended to the Grant Lake Dam in order to facilitate the construction work.

BOULDER SYSTEM

Representatives of the Department conducted tests at the factory on carrier current equipment to be installed on the Boulder Transmission line, and it is hoped that the complete equipment will be installed early in the coming fiscal year.

RADIO INTERFERENCE

While the number of complaints of radio interference apparently affecting the Department, totaling 1,061, was a material increase over the previous fiscal year, only 54 of these were directly traceable to the lines and equipment of this Department and represented only 5% of the total number of complaints as compared with 8% during the previous year, showing a marked improvement in the condition of our system.

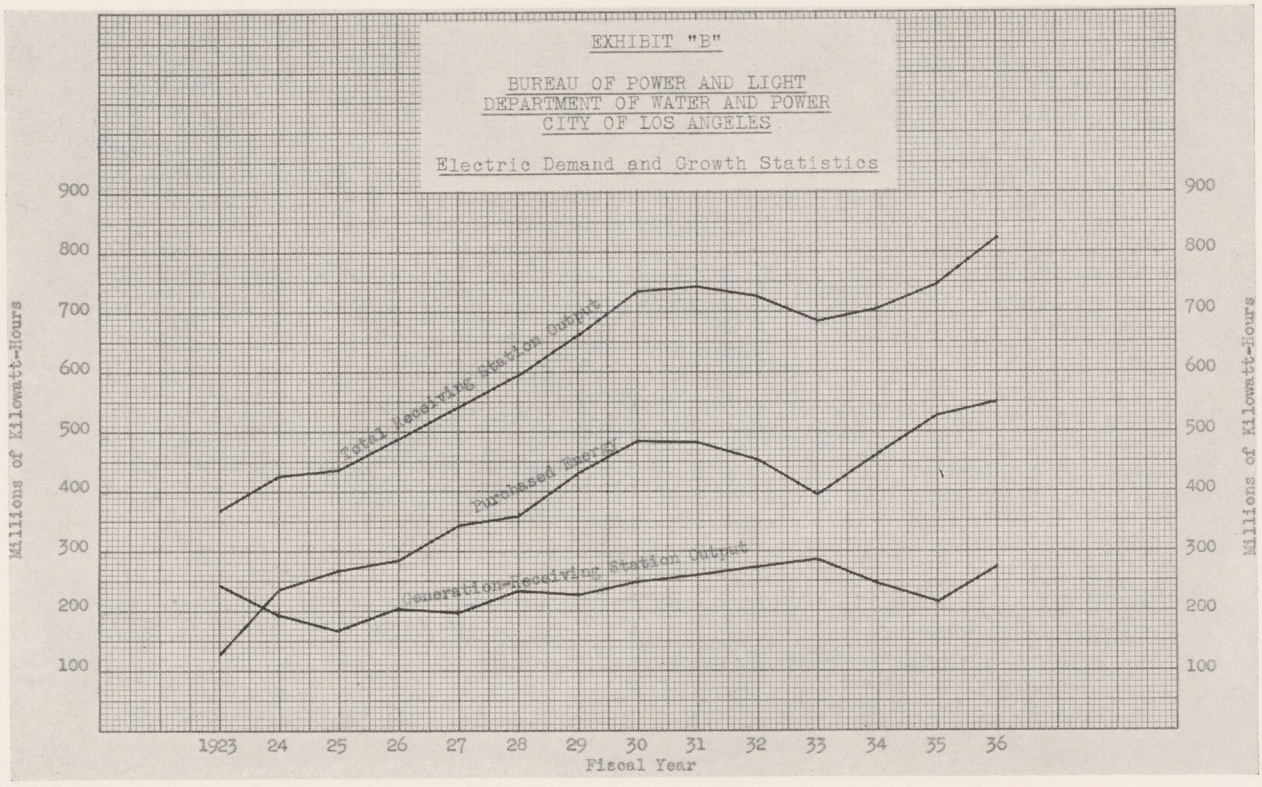


EXHIBIT "B"
BUREAU OF POWER AND LIGHT
DEPARTMENT OF WATER AND POWER
CITY OF LOS ANGELES
Electric Demand and Growth Statistics
Millions of Kilowatt-Hours
Total Receiving Station Output
Purchased Energy
Generation
Receiving Station Output
Fiscal Year
1923 24 25 26 27 28 29 30 31 32 33 34 35 36
100 200 300 400 500 600 700 800 900

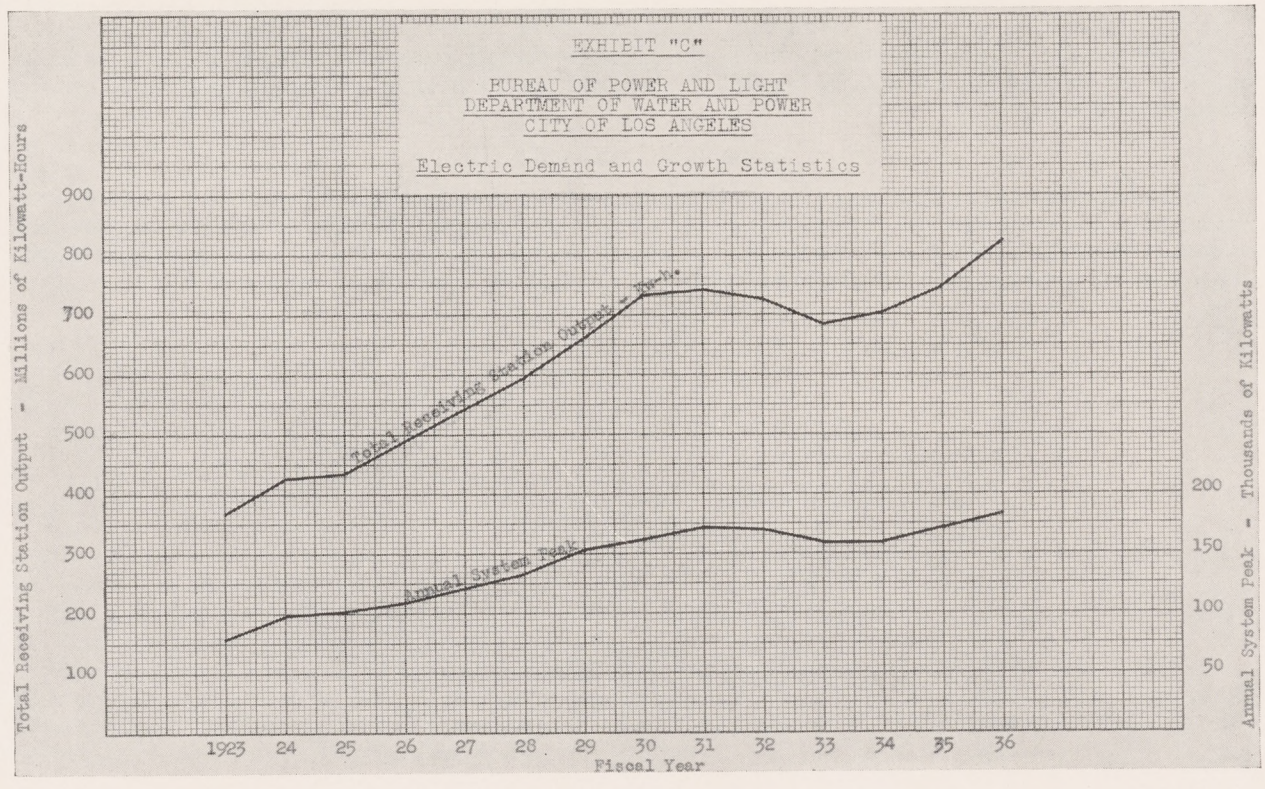


EXHIBIT "C"
BUREAU OF POWER AND LIGHT
DEPARTMENT OF WATER AND POWER
CITY OF LOS ANGELES
Electric Demand and Growth Statistics
Total Receiving Station Output - Millions of Kilowatt-Hours
Annual System Peak - Thousands of Kilowatts
Total Receiving Station Output - Basic
Annual System Peak
Fiscal Year
1923 24 25 26 27 28 29 30 31 32 33 34 35 36
100 200 300 400 500 600 700 800 900
50 100 150 200

EXHIBIT "A"

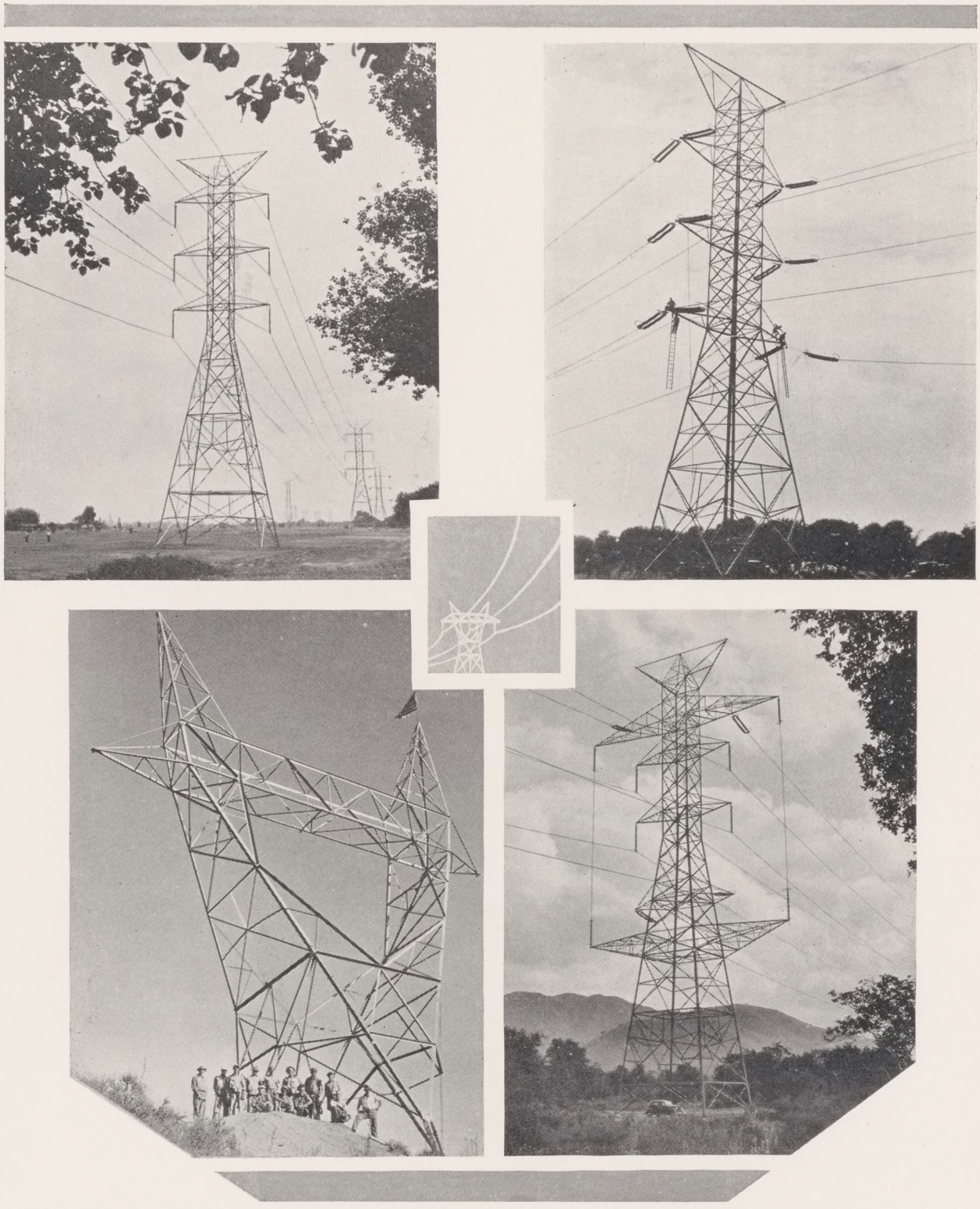
BUREAU OF POWER AND LIGHT

DEPARTMENT OF WATER AND POWER

CITY OF LOS ANGELES

REPORT OF SYSTEM OPERATION FOR THE FISCAL YEAR 1935-36

Month	GENERATION—AQUEDUCT HYDRO PLANTS								PURCHASED ENERGY			GRAND TOTAL	TOTAL RECEIVING STATION OUTPUT		
	San Francisquito P. P. No. 1 Kw-h.	San Francisquito P. P. No. 2 Kw-h.	San Fernando P. P. No. 3 Kw-h.	River P. P. No. 4 Kw-h.	Franklin P. P. No. 5 Kw-h.	Total Kw-h.	Peak Kw.	Load Factor %	Kw-h.	Peak Kw.	Load Factor %	Kw-h.	Kw-h.	Peak Kw.	Load Factor %
July 1935	16,733,700	10,176,000	3,803,000	.....	484,000	31,196,700	100,200	41.8	34,210,782	55,776	82.4	65,407,482	63,120,302	149,100	56.9
Aug. 1935	17,015,800	10,353,000	3,968,000	.....	521,000	31,857,800	103,200	41.5	37,880,883	58,800	86.6	69,738,683	67,296,663	154,500	58.5
Sept. 1935	13,491,100	8,062,000	3,068,000	.....	471,000	25,092,100	103,300	33.7	41,984,441	65,520	89.0	67,076,541	64,974,513	160,500	56.2
Oct. 1935	12,775,300	7,440,000	3,029,000	.....	377,000	23,621,300	105,100	30.2	48,237,264	72,384	89.6	71,858,564	69,584,943	170,700	54.8
Nov. 1935	9,897,100	5,584,000	2,305,000	.....	260,000	18,046,100	101,900	24.6	51,836,165	83,280	86.5	69,882,265	67,894,957	178,300	52.9
Dec. 1935	11,007,500	6,194,000	2,549,000	.....	305,000	20,055,500	108,300	24.9	54,222,865	85,200	85.6	74,278,365	72,369,675	183,200	53.1
Jan. 1936	12,329,800	6,997,000	2,852,000	.....	270,000	22,448,800	108,100	27.9	52,076,084	80,880	86.7	74,524,884	72,621,043	179,000	54.5
Feb. 1936	12,232,800	6,985,000	2,402,000	.....	234,000	21,853,800	109,900	28.6	47,822,539	76,320	89.8	69,676,339	67,828,765	175,000	55.7
Mar. 1936	13,514,500	7,786,000	3,102,000	.....	483,000	24,885,500	108,000	31.0	48,452,985	72,048	90.3	73,338,485	71,188,203	167,700	57.1
Apr. 1936	13,392,800	7,815,000	3,232,000	.....	450,000	24,889,800	110,300	31.3	45,408,047	69,648	90.5	70,297,847	68,222,717	166,500	56.9
May 1936	13,751,600	8,146,000	3,213,000	.....	700,000	25,810,600	109,300	31.7	44,937,965	64,512	93.4	70,748,565	68,626,459	163,000	56.6
June 1936	16,113,100	9,678,000	3,493,000	.....	707,000	29,991,100	112,300	37.1	41,328,463	60,096	95.1	71,319,563	69,004,067	159,400	60.1
TOTAL	162,255,100	95,216,000	37,016,000	.....	5,262,000	299,749,100	112,300	30.4	548,398,483	85,200	73.2	848,147,583	822,732,307	183,200	51.1



Types of towers in Boulder Canyon Power Transmission Line: (Top, left to right) Double circuit standard suspension and deadend. (Bottom, left to right) Single circuit deadend and double circuit transposition.

Design and Construction Division

H. C. GARDETT, *Engineer of Design and Construction*

GENERAL ENGINEERING

DURING the fiscal year 1935-36, in cooperation with the engineers of the United States Bureau of Reclamation, studies covering the design of the generating plant and machinery of the Boulder Canyon Project were continued and assistance was rendered in the checking of plans and specifications for plant equipment of various types and in the checking of bidders' drawings and proposals.

Studies were also made to forecast the probable water storage and available power during the first few years of operation of the plant.

Field inspections of the plant and machinery were also continued, as well as studies and tabulations of the results of tests on various units of equipment.

On the Boulder Canyon Transmission Line Project, the conductor vibration studies were continued through the year. New instruments were developed to carry on this work and additional tests were conducted at the laboratory at Stanford University.

A machine was designed and built for testing the conductor splices and making new splices on cable in the air and under full tension.

A new sag calculation form was developed, simpler and more accurate than that formerly used, particularly for long or steep spans.

A design was started for a system of neon lighting for the towers in the vicinity of Kingston Valley Airport.

Studies and investigations have been carried on covering the future power supply and the necessary work to protect the City's rights in various power projects has been performed.

TESTING LABORATORIES

During the latter part of the fiscal year, the work of the Testing Laboratories was considerably augmented due to the contemplated change from 50 to 60 cycles. A summary of the work for the yearly period shows 182,133 meters having been tested and inspected.

Tests on material, including physical, chemical, and electrical tests, amounted to 17,005 and 27,000 tests were made on equipment such as transformers, switches, insulators, regulators, rubber gloves, etc.

During the year there was added to the testing equipment a 350,000 volt test transformer, which will be of great benefit to this section in carrying on its work in the future. In addition to this, there was also installed a Weatherometer, which will greatly accelerate the effect of weather on such items as lacquers, varnishes, weatherproof coating on wires, etc., and aid the Department engineers in determining the quality of such items in a very short period of time.

Time switches and clocks, indicating and graphic meters were maintained and repaired as needed and 1361 special tests were made on orders received from different departments.

POWER DRAFTING ROOM

During the past fiscal year, the drafting room made a total of 1899 drawings. The general index has been maintained as usual. Fourteen thousand blue prints were received from contractors, which were given numbers, indexed, and filed. Orders were written for 272,253 square feet of blue prints and 23,271 square feet of blue line prints, which were distributed as called for.

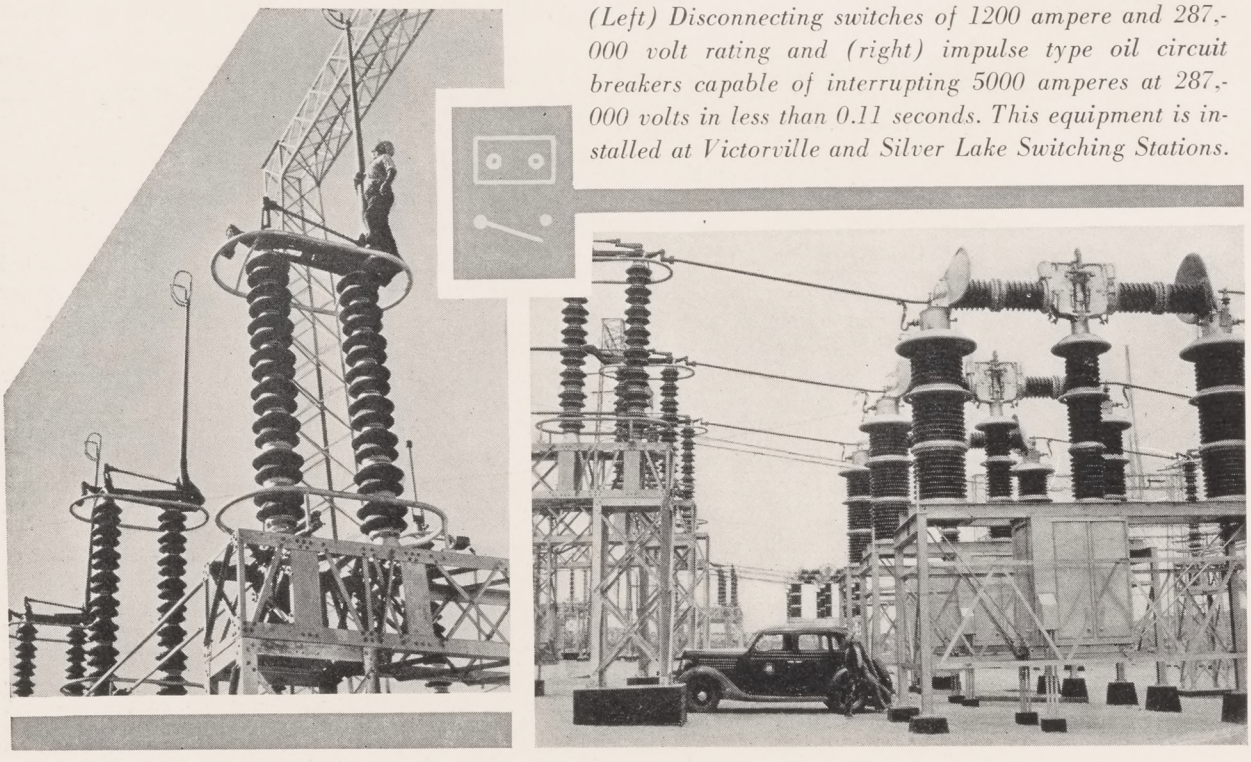
RIGHT OF WAYS

BOULDER CANYON TRANSMISSION LINE

All surveys of the line are complete between Los Angeles and Boulder Dam. In the San Bernardino County area, approximately 97 per cent of the privately owned land has been acquired and in the Los Angeles County area approximately 53 per cent.

BELT TRANSMISSION LINE

The maintenance of the Loop Transmission Line right of way between Receiving Station "A" and Receiving Station "B" and the houses owned by the Department on the entire Loop Line right of way has been continued by this Division.



(Left) Disconnecting switches of 1200 ampere and 287,000 volt rating and (right) impulse type oil circuit breakers capable of interrupting 5000 amperes at 287,000 volts in less than 0.11 seconds. This equipment is installed at Victorville and Silver Lake Switching Stations.

DESIGN AND CONSTRUCTION

Boulder Canyon Transmission Line Project

The work on the various items of the project as detailed has been carried on during the entire year and on June 30, 1936, 1110 employees were engaged on this project.

Transmission Line and Switching Stations

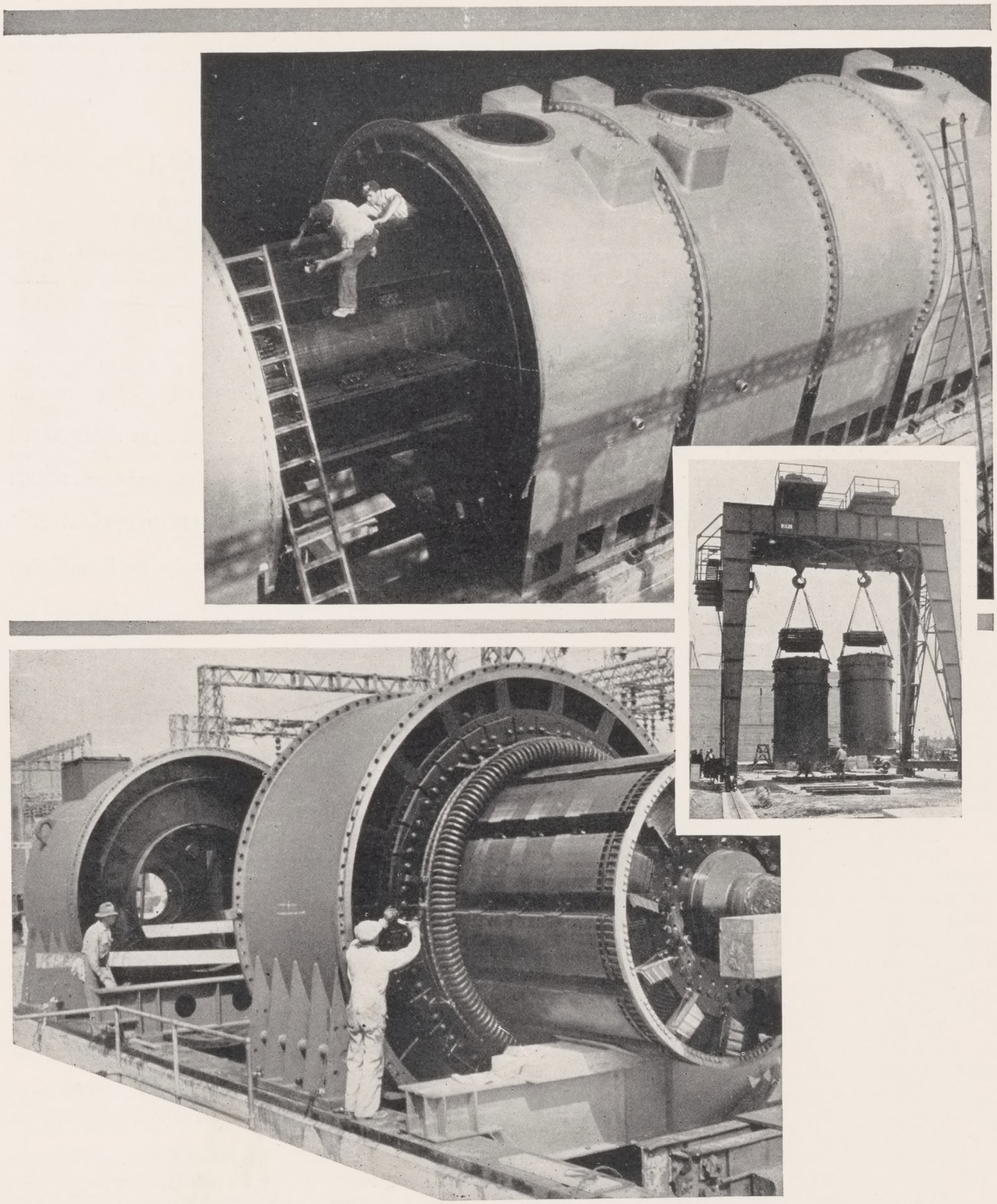
The work on the section of the line, with two lines of single circuit towers, from Boulder Power Plant to the San Bernardino-Los Angeles County line, has been carried on from seven construction camps. Footings have been excavated, stubs set, and concrete poured for 2688 towers which represents approximately 99:5 per cent for this class of line construction. There have been erected 2678 towers, or approximately 99 per cent of the total number of towers to be erected. Laying of the counterpoise wire is now approximately 98 per cent completed and the stringing of the overhead ground wire has been completed on 230 miles or 86 per cent of the transmission line. The stringing of the conductor has been completed on 262 miles of line, approximately 98.6 per cent of the total distance and 9905 units of insulation have been installed, approximately 99 per cent of the total.

The construction of roads has been carried on during the year and also the necessary work required by the Forestry Department to protect certain areas from the danger of fire and erosion.

Construction at Victorville and Silver Lake Switching Stations was carried on during the year. The erection of the switch racks and the installation of the bus, oil circuit breakers and disconnecting switches were completed at both stations and construction of the control houses is under way.

Transmission Line Step-Down Station

Construction work was commenced early in the year and the installation of the equipment for stepping down the Boulder Transmission Line voltage at Receiving Station "B", located at 96th Street and Central Avenue, from 275 kv. to 132 kv. is approximately 90 per cent completed. This step-down installation consists of two banks of three 65,000 kva. 275-132 kv. auto transformers each, with an additional spare transformer. A 150-ton Gantry crane has been installed for handling these transformers.



Receiving Station equipment: (Top) 60,000 kva. frequency changer; (Bottom) One of four synchronous condensers; (Inset) Testing 187-ton capacity gantry crane for handling transformers.

RECEIVING STATION "B" RECEIVING STATION FACILITIES

Work was continued on the installation of the electrical equipment and this construction is now complete except for miscellaneous minor details and checking of the wiring on the installation of the two 60,000 kva. synchronous condensers.

TIE LINE TERMINAL FACILITIES
RECEIVING STATIONS "A", "B" AND "C"

The installation of equipment has continued at Receiving Stations "A", "B", and "C" and at Stations "A" and "B" it is approximately 95 per cent completed.

POWER PLANTS

Plans and specifications were prepared and the contract awarded for the construction of five operator's cottages and two garages at San Francisquito Power Plant No. 1 and two cottages and one garage at San Francisquito Power Plant No. 2. This construction is now in progress under the inspection of the engineering forces of the Division.

TRANSMISSION LINES AND RECEIVING STATIONS

Work was commenced June 13 on the completion of the 132 kv. Loop Transmission Line through Huntington Park and South Gate and excavations and concreting of tower footings was approximately 50 per cent complete at the end of the fiscal year.

At Receiving Station "A", the capacity of the 110 - 34.5 kv. transformer bank No. 1 was increased to 30,000 kva. by replacing three 5000 kva. transformers with three new 10,000 kva. transformers.

Plans and specifications were prepared and construction was commenced on the installation of a new 60,000 kva. 132 - 34.5 kv. outdoor transformer bank.

The 34.5 kv. busses were rearranged and the 34.5 kv. line positions were changed so as to bring out all 34.5 kv. overhead lines from the 4th floor of the station.

Twelve 34.5 kv. oil circuit breakers are being replaced with new breakers, each having an interrupting capacity of 1,500,000 kva.

High speed relays were installed on the St. John-Pasadena 34.5 kv. lines replacing older relays and the oil and water piping on four transformer banks was replaced. Coupling capacitors were installed on the 132 kv. line positions for use when synchronising.

At Receiving Station "B", the construction of the 34.5 kv. transformer bank was completed and plans and specifications completed and construction commenced on the installation of equipment for a new 34.5 kv. line. Motor operating mechanisms were added to the 34.5 kv. bus tie disconnecting switches, which were formerly manually operated, and minor changes were made in the relay protection.

At Receiving Station "C", the 34.5 kv. rack "C" was completed and placed in operation and the relays on the Wilmington-San Pedro lines were changed to the high speed type. Also minor betterments to station facilities were installed.

DISTRIBUTING STATIONS AND GENERAL STRUCTURES

Construction work on Distributing Station No. 29, located at 15345 Sunset Boulevard, Pacific Palisades, was started July 15 and this new permanent type station is now ready for service. It is a one story reinforced concrete building with an initial installation of two 34.5 kv. lines, two 4800 volt feeders, and two banks of transformers having a total capacity of 3000 kva. Space is provided for two additional 34.5 kv. line positions, four additional regulated and two unregulated feeders, and three street light positions. This is the first distributing station on the Department's lines to be equipped with 34.5 kv. automatic transfer equipment. This station is designed for future supervisory control from Distributing Station No. 44. The equipment for this remote control has been authorized and will be installed immediately.

Construction on Distributing Station No. 30 located at No. 4905 North Maywood Avenue, Eagle Rock, was started during August, 1935, and the building, a one story concrete structure, and the landscaping is now complete. The installation of the electrical equipment will be completed early in the next fiscal year.

The station at present has two 34.5 kv. lines, two banks of transformers with a total capacity of 6000 kva., four 4800 volt regulated feeders and one street light regulator. Space is provided for two additional line positions, twelve additional feeders, and three additional street light positions.

At both Distributing Stations Nos. 29 and 30, all feeders enter the building underground and both stations with landscaped grounds present a very artistic appearance and will be an asset to the community.

At Distributing Station No. 3, the work of installing high speed breakers together with control wiring and new busses has been completed.

The supervisory control equipment by which Distributing Stations Nos. 22 and 24 are controlled from Distributing Station No. 21 at Van Nuys was placed in service and is now in satisfactory operation.

Distributing Stations constructed during year: (Top) No. 30, 4905 North Maywood Avenue, Eagle Rock, and (Bottom) No. 29, 15345 Sunset Blvd., Pacific Palisades.

The necessary equipment for one additional feeder was installed at Distributing Station No. 10 and plans were prepared for increasing the speed of operation of sixteen 34.5 kv. oil circuit breakers at Distributing Station No. 13 to meet the Department's present standards.

On June 30, 1936, there was a total of 63 station-type and 22 pole-type industrial stations in service, making a total of 85 industrial stations, with an aggregate capacity of 104,531 kva., an increase of 3 stations and 3,145 kva. of installed transformer capacity for the fiscal year.

On June 30, 1936, there was a total of 245 commercial stations in service on the lines of the Department of Water and Power, having an aggregate transformer capacity of 89,720 kva., a net increase for the fiscal year of 13 commercial stations and 5,929 kva. of installed transformers.

Architects plans and specifications for the construction of an office building at 59th Street and Vermont Avenue for the use of the Commercial Division were checked and contract was awarded for the construction under the inspection of the engineers of the Division. Plans and specifications were prepared for minor changes to various Department buildings and work was done for other Divisions as requested.

FREQUENCY CHANGE

POWER PLANTS, RECEIVING AND DISTRIBUTING STATIONS

Preparatory to the change of system frequency, all equipment at the power plants, receiving and distributing stations, which would be affected by the change was listed and an engineering study made to determine the changes necessary for satisfactory operations at 60 cycle. Temporary changes at Power Plants Nos. 1 and 2 have been made in order to operate at either 50 or 60 cycles during the change over period. At Receiving Station "A" transformer banks Nos. 2, 3, 4, 5, and 6 were reconstructed for 60 cycle operation.

At various distribution stations, the rotating machinery was changed or adopted for 60 cycle operation and street light regulators, induction regulators, and miscellaneous units of automatic equipment were tested and will be adjusted at the time of the change in frequency.

A temporary building was erected at 1630 North Main Street for use as a transformer repair shop, during the changing of station transformers for 60 cycle operation and a temporary meter repair shop was constructed for the Testing Laboratory Frequency Change Section.

The changing of consumers' meters by the Test Laboratory has been carried on during the year and total of 165,669 meters have been removed, tested, and reset for 60 cycle operation.

DESIGN OVERHEAD AND UNDERGROUND SYSTEM

OVERHEAD 33,000 VOLT SYSTEM

Plans and estimates prepared for overhead 33,000 volt line construction resulted in a net total mileage for the system as follows:

266.46 miles of single circuit trunk line
66.1 miles of double circuit trunk line
77.0 miles of single circuit peddler line
4.1 miles of double circuit peddler line
Total—483.86 circuit miles

OVERHEAD LOW VOLTAGE SYSTEM

The total overhead distribution system now in operation consists of 186 regulated circuits and 20 unregulated circuits. Total capacity of regulated circuits is 310,800 kva. Plans and estimates prepared for overhead low voltage line construction resulted in the addition of 32 circuit miles of primary and 22 circuit miles of secondary. The overhead system now consists of approximately 1822 circuit miles of primary and 1034 circuit miles of secondary lines.

During the year, plans and estimates called for the setting of 3162 poles of which 813 replaced "M" poles and 349 replaced "E" poles. Five hundred thirty-eight poles were removed from the system giving a net increase of 1462 for 1936, as compared to an increase of 1290 poles for 1935. There is an estimated total of 134,107 poles now installed.

At the end of the year, there were 17,810 overhead distribution transformers in service with a total capacity of 308,420 kva. This was an increase of 546 transformers of 10184.5 kva. capacity over the previous year.

UNDERGROUND 33,000 VOLT SYSTEM

Plans and specifications, prepared for construction for the year, resulted in the addition of 3.6 miles of conduit line to the system and the installation of 16271 feet of cable. The cable removed amounted to 3423 feet, leaving a total of 55.6 miles of cable in operation.

The system now consists of 266 miles of ducts, 55.6 miles of cable and 559 manholes. The duct feet under other ownership and operated by the Bureau of Power and Light remains at 10504 feet.

UNDERGROUND LOW VOLTAGE SYSTEM

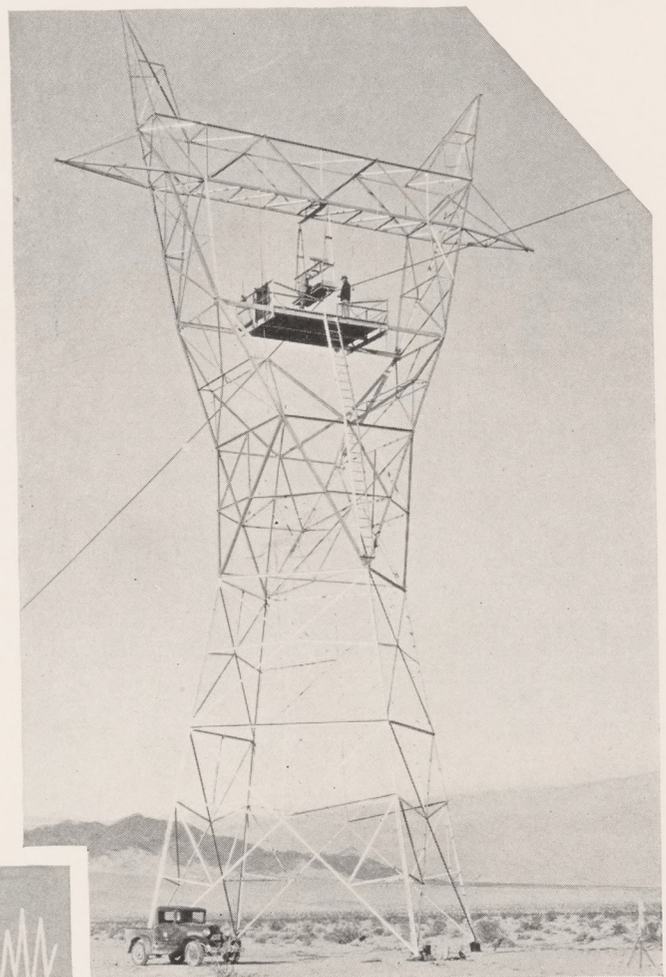
Plans and specifications, prepared during the year, resulted in the addition of 5.7 miles of conduit line, 15 vaults, 78 manholes and the installation of 63.8 miles of cable and 91 transformers, having a combined capacity of 3082 kva.

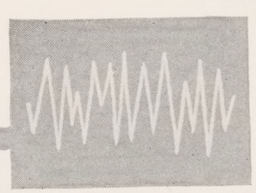
There are now in service 1103 distribution transformers, having a total capacity of 67600.5 kva. There are also 552 constant current street lighting transformers, having a combined capacity of 8901 kva.

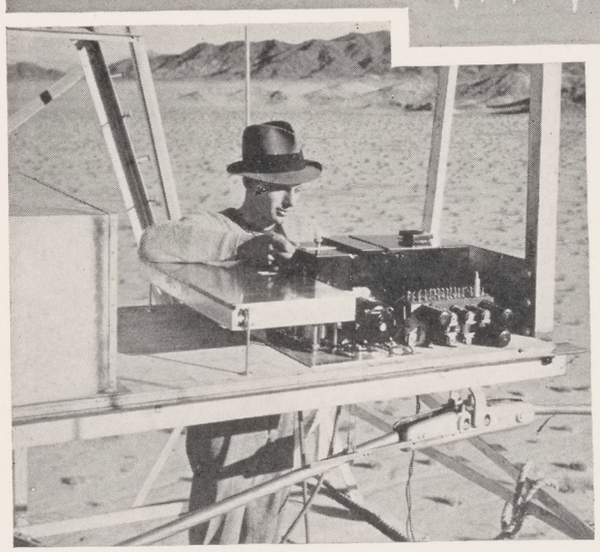
The underground low voltage system now consists of 1099.1 duct miles of conduit, 3731 manholes, including those owned by improvement districts and others, 991 vaults, including those owned by improvement districts and others, and 1057.9 miles of cable.

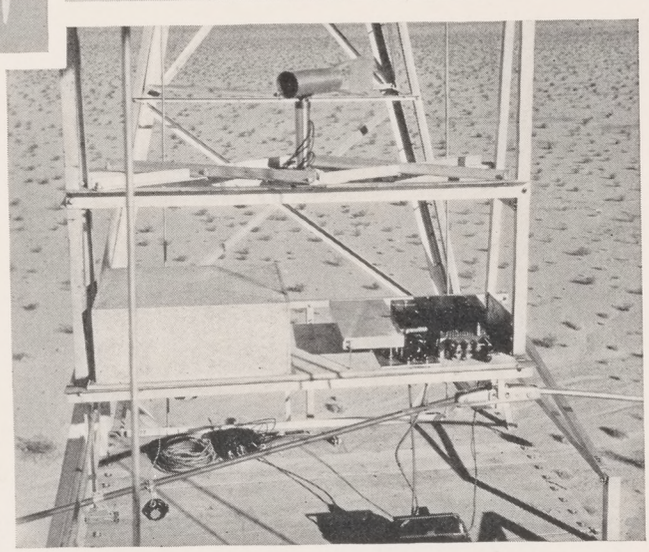
There was a net increase of three automatic transfer switches making a total of 69 now in operation.

Vibration studies of the Boulder Canyon Transmission Line conductors were carried on in the field and at Stanford University. New instruments to conduct the studies were developed by Bureau of Power and Light Engineers and installed on a platform built in one of the single circuit towers of the Transmission Line at a point near Silver Lake, about 200 miles from Los Angeles. Layout shows general view and details of vibration research setup.









MISCELLANEOUS DISTRIBUTION

OVERHEAD SYSTEM

Transformer load tests	3400
Voltage tests	841
Special tests	122

In making these tests 58,262 miles were traveled.

UNDERGROUND SECTION

Transformer load tests	519
Voltage tests	226
Tests on consumers' premises	195
Electrolysis tests	286
Temperature tests on street lighting transformers	63
Miscellaneous tests	5

Number of miles traveled in making tests 8119.

Joint Pole negotiations carried on with other companies resulted in the approval of bills of sale amounting to $62,490.03 of which $37,888.31 represented sales to other companies. There are approximately 69,932 poles now used jointly with other utilities.

During the year 5320 investigations were made at the request of consumers, contractors and members of the Joint Pole Committee and 1786 job orders and authorizations were issued to take care of conditions where changes were necessary.

Business Agent's Division

BURDETT MOODY, *Business Agent*

THE sale to consumers and therefore the use of electrical energy as measured by kilowatt-hour consumption for the year ending June 30, 1936, very clearly indicates the rapid economic recovery of general conditions throughout the City.

For all uses, the increase in kilowatt-hour sales for the past year is 11.1% over the previous year, and a reference to Chart No. 1 discloses that a new high record has been reached, amounting to 11.6% increase over the former peak which occurred in the fiscal year ending June 30, 1931. Similarly, the curve showing domestic service (Chart No. 2) shows the average annual consumption as of June 30, 1936, to have been 658 kilowatt-hours as compared with the previous high figure in 1936 of 602 kilowatt-hours.

There is attached the customary series of Tables "A" to "F" prepared by the Sales and Rate Statistics Research Section, which indicate the growth of the system and the utilization by consumers of electrical energy, particularly with reference to competitive and general load building work.

GENERAL COMMENT

Referring to Table "A", because of the discontinuance of the Combination Light and Power schedule as of February 1, 1936, the meters, kilowatt-hours and revenue formerly under that schedule, now appear under the headings of "Lighting" and "Power". For this reason the percentage increases under "Lighting" and "Power" as compared with the previous year, are not precise percentages, being somewhat large. However, the "Street Lighting" and "All Uses Combined" present accurate figures of increase for 1935-36.

Table "B" is useful for reference purposes, showing official classified totals of number of consumers, kilowatt-hours consumed, and total revenue.

Table "C" is a three-year comparison of averages, and somewhat disrupted as to "Commercial Light and Power", due as stated above to the discontinuance of the former "Combination Light and Power" schedule February 1, 1936. It is therefore accurate only as to residential light and industrial power. It is particularly interesting to note that the industrial power kilowatt-hours have increased 23.1% over the previous year, the revenue increase of 12.3% being minimized of course by the rate reduction during the year.

Tables "D", "E", and "F", classified connected load, also show the same favorable trend. In connected power load there is an increase of 10% over the previous year, and favorable increases in all excepting three sub-classifications as indicated in Table "D". Table "E" is particularly interesting because of the large percentage of increase in residential major appliance connected load over the previous year, ranges having increased 31.8%, water heaters 45.9%, and all residential major appliances having increased 30.4%.

SALES AND RATE STATISTICS RESEARCH

Detailed studies and analyses were made of consumption and revenue in the various classifications of use, as a basis for recommendations presented which resulted in new rate schedules being placed in effect February 1, 1936. This rate reduction amounted to $1,627,000 per annum, equivalent to 10% of gross revenues, and benefited all classes of consumers. Similarly, early in the year studies and rate recommendations were completed relating to the Owens Valley Light and Power System, which also resulted in the establishment of a new schedule effective October 1, 1935. Further studies have been in progress looking to further changes that should be recommended covering the Owens Valley Light and Power System rates.

STREET LIGHTING

During the year, the tendency of property owners to decrease ornamental street lighting was definitely checked as indicated by the sustained revenue from ornamental lighting only, and from the records of changes in the ornamental lighting systems. The total kilowatt-hour sales for street lighting was practically the same as that of last year, the difference being a decrease of only 0.2%, whereas in 1935 it was 2.4% less than the total for the previous year, and in 1934, a decrease of 4.0%.

RATE CONSULTATION SERVICE, TESTS AND INSPECTIONS

The usual volume of business was handled in advising consumers as to the application of electric rate schedules to their best benefits, the handling of adjustments and complaints involving engineering matters, and tests and inspections on consumers' premises in the interests of satisfactory and economical use of energy. The

change in rates effective February 1, 1936, created a temporarily added responsibility in advisory functions with consumers and coordination with the Billing Section of the Commercial Division.

ADMINISTRATION OF LINE EXTENSION ACCOUNTING

(NEW SUBDIVISIONS)

Activity in real estate subdivisions and other line extensions is shown by the following data:

During the year there were initiated 1424 authorizations (cancelled authorizations omitted) for new extensions or for additional load on consumers' premises, as compared with 1056 authorizations last year. Of this number, 23 were to serve new tracts or plots or land, compared with 16 last year, the locations of which are shown below:

West Los Angeles district	9
San Fernando Valley district	11
Los Angeles district	2
Harbor district	1
Total Tracts	23

The total amount deposited this year for extensions to tracts under the Bureau's Standard Extension Deposit Contract plan was $9,945.10. Last year this amount was $5,123.35. The accumulated total refundable balance of such deposits on hand as of June 30, 1936, was $174,261.00. During the year, there was transferred, on account of expired contracts $47,678.09 from the refundable deposit account to "Donations in Aid of Construction". This money, in accordance with the terms of the contracts, thus becomes the property of the Department.

FREQUENCY CHANGE—CONSUMERS' EQUIPMENT

The preliminary contact with power consumers relative to the frequency change and the primary survey was completed during the year, with a total of 18,054 power services covered. The mailing of questionnaires to commercial lighting consumers for listing equipment was completed, involving a total of 33,963 questionnaires. The mailing of questionnaires to domestic consumers was also completed, excepting the considerable monthly volume required by the turning off and turning on of meters. During the year there were mailed 218,754 such domestic questionnaires. This Section has supervised the engineering and arranged for the testing of a great variety of equipment ordinarily connected to general lighting and domestic meters, and has taken care of the requirements regarding electric synchronous clocks and synchronous clock operated equipment. With the cooperation of other divisions, it has also progressed the writing of specifications and the preparation of data relative to the cycle changing of elevators. A considerable number of formal contracts and purchase orders have been executed for cycle-changing equipment. During the year premises were leased at 2100 South Figueroa Street to provide a Central Clock Depot for the cycle-changing of clocks, a warehouse for a stock of clocks and parts, and a central headquarters for supervisors and the inspection personnel concerned with domestic equipment. As of June 30, 1936, the number of employees in this Section was 269.

COMMERCIAL AND INDUSTRIAL BUSINESS FOR THE YEAR

The commercial and industrial business for the past fiscal year has shown a marked increase over 1935, effected by the continued general business improvement resulting in great new building activity for schools, apartments, markets and store buildings, and considerable stimulation to the promotion of load building for lighting, heating, commercial cooking and baking, and air conditioning such as in new and existing commercial institutions now financially able to make improvements and to advertise. In the industrial concerns particularly, productions have increased and plants are operating on their full capacity. Many firms have purchased motors and other equipment for improving and increasing production. Following is the total commercial and industrial business secured from new building construction and through the Bureau's efforts in promotional load building:

67 applications for apartments and courts, representing 375 kilowatts and estimated annual revenue of $5,945.00.

787 applications for lighting of markets, stores, public buildings and schools, totaling 5,376 kilowatts, estimated annual revenue, $148,332.00.

2080 applications for commercial and industrial power, with a total of 12,950 horsepower, and estimated annual revenue of $160,877.00.

A large portion of the industrial power increase consists of an additional load of existing power consumers who expanded and increased their production: Increased power load segregated by industries is as follows:

Motion picture industry	1,000	horsepower
Rubber industry	800	"
Metal Working industry	1,200	"
Oil industry	500	"
Furniture industry	600	"
Food Production industry	300	"
Printing industry	200	"
Aviation industry	1,200	"

Included in the industrial business for this fiscal year were a number of small factories new to this area. One large industry, the North American Aviation Company, located here and has a connected load of 900 horsepower, and 100 kilowatts in lighting load.

In an endeavor to secure a larger share of this large industrial business for the Department, there has been added to the staff of this Division a Special Industrial Agent who has had a number of years of experience in industrial real estate. Through his activities we offer to prospective new industries a survey of all available acreage in the City including prices and details on railroad and other available facilities.

PROMOTIONAL LOAD BUILDING

The Illumination Engineers and regular salesmen are responsible for the promotion of additional lighting in existing and new commercial buildings amounting to 2,671 kilowatts, with an estimated annual revenue of $80,000.00. This addition consisted of 92 kilowatts in sign lighting, 215 kilowatts in display lighting, 535 kilowatts in general lighting, and 265 kilowatts in flood lighting.

The specialist on industrial heating and air conditioning aided in the sale of 1,258 kilowatts of industrial heating load, which included electric ovens and welding equipment for industrial processes. In department stores, restaurants, and office buildings, 575 horsepower in air conditioning load was added.

Engineering reports were made analyzing the installation of gas, oil and steam generating plants in factories, office buildings, and markets belonging to the Bureau's consumers, involving a total connected load of over 2,000 kilowatts. A total load of only 150 kilowatts of service was lost to competitive power sources, and of this, 125 kilowatts were regained within two months after operating on gas equipment.

The Commercial Heating Section was responsible for the connection of 559 kilowatts of commercial baking and cooking equipment in restaurants and institutions with an estimated increase in annual revenue of $13,975.00. In addition, during this fiscal year, electrical installations have been approved and ordered for cafeterias in San Pedro High School, Griffith Park Club House, and the Police Club House.

Electric space heating received considerable acceptance in homes through the reduction in rates, making an all-electric home, including water heating, cooking and space heating, competitive in annual operation cost with gas. Over 20 completely equipped all-electric homes were built during this past fiscal year. The total space heating consisted of 111 installations in residences, with 822 kilowatts connected and an estimated revenue of $4,000.00. Forty-six installations were made to commercial and industrial consumers as supplementary heating, with a total of 518 kilowatts connected and an estimated annual revenue of $3,648.00.

DOMESTIC APPLIANCES

The purpose of the Domestic Appliance Section is to develop the market for the sale and use by consumers of electrical appliances in the home. The personnel consists of salesmen and saleswomen, home economists, demonstrators and service men who are employed in the following groups:

I. Major Appliance Sales
II. Major Appliance Installation Service
III. Home Economics
IV. Appliance Display

ELECTRIC RANGE AND WATER HEATER SALES

A total of 18,161.32 kilowatts of connected load was added to the Bureau's system, representing the installation of 1789 electric ranges and 464 water heaters, tabulated by districts as follows:

San Fernando Valley	6222.57 kw.	594 ranges	279 water heaters
Los Angeles	7907.15 kw.	799 ranges	106 water heaters
West Los Angeles	2302.45 kw.	225 ranges	43 water heaters
San Pedro	1729.15 kw.	171 ranges	36 water heaters

Assuming an annual revenue of $26.00 from each range, and $37.50 from each water heater, the potential annual gross revenue from these two appliances alone amounts to $63,914.00.

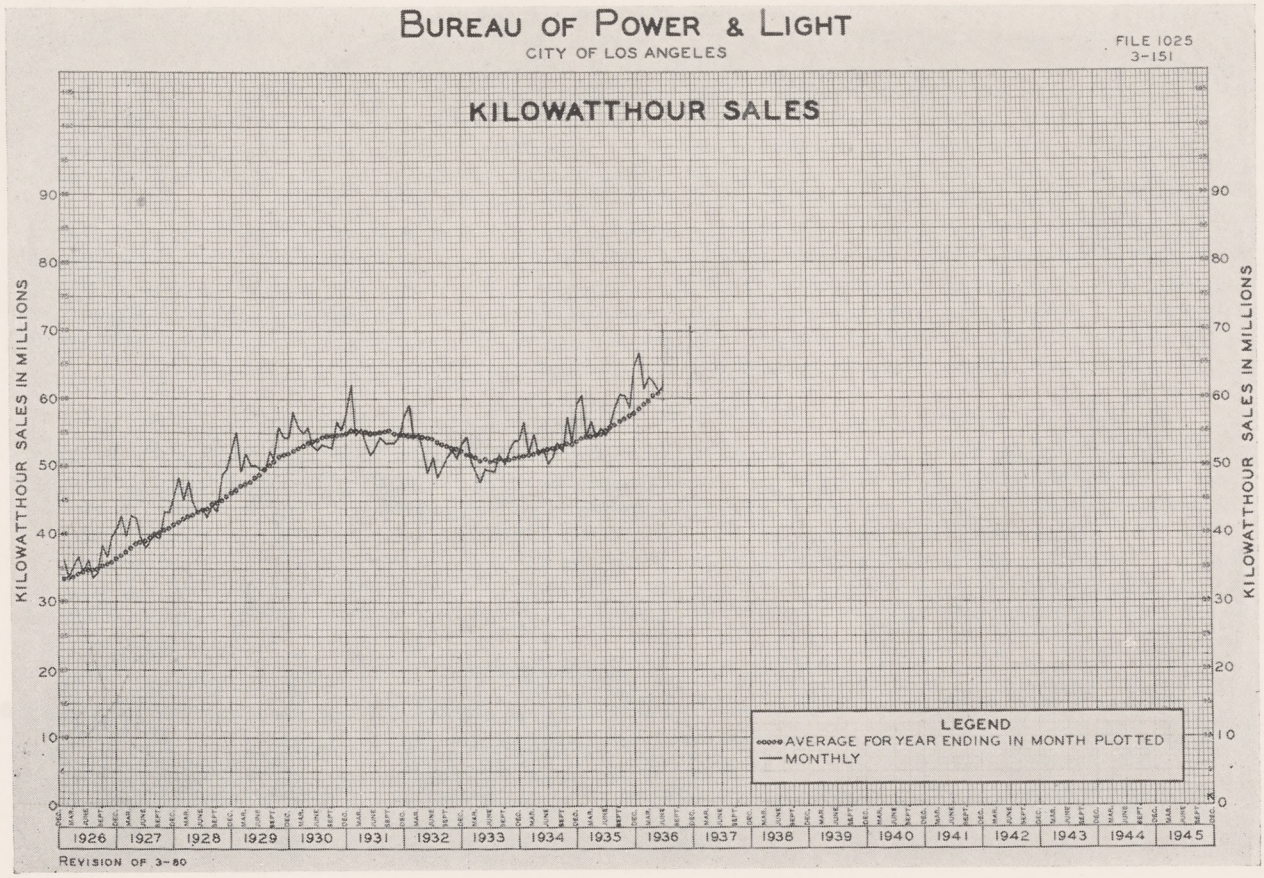
The record of total installations includes electric ranges and water heaters but it does not include refrigerators, space heaters and many small appliances sold by the cooperating dealers with whom the representatives of this Section maintain a regular contact. A semi-annual tabulation has been compiled, which shows the sales made by dealers in all sections of the city. This report discloses that 123 dealers sold a total of 20,204 refrigerators, 9,425 radios, 3,041 vacuum cleaners, and 8,114 washers, during the first six months of 1936.

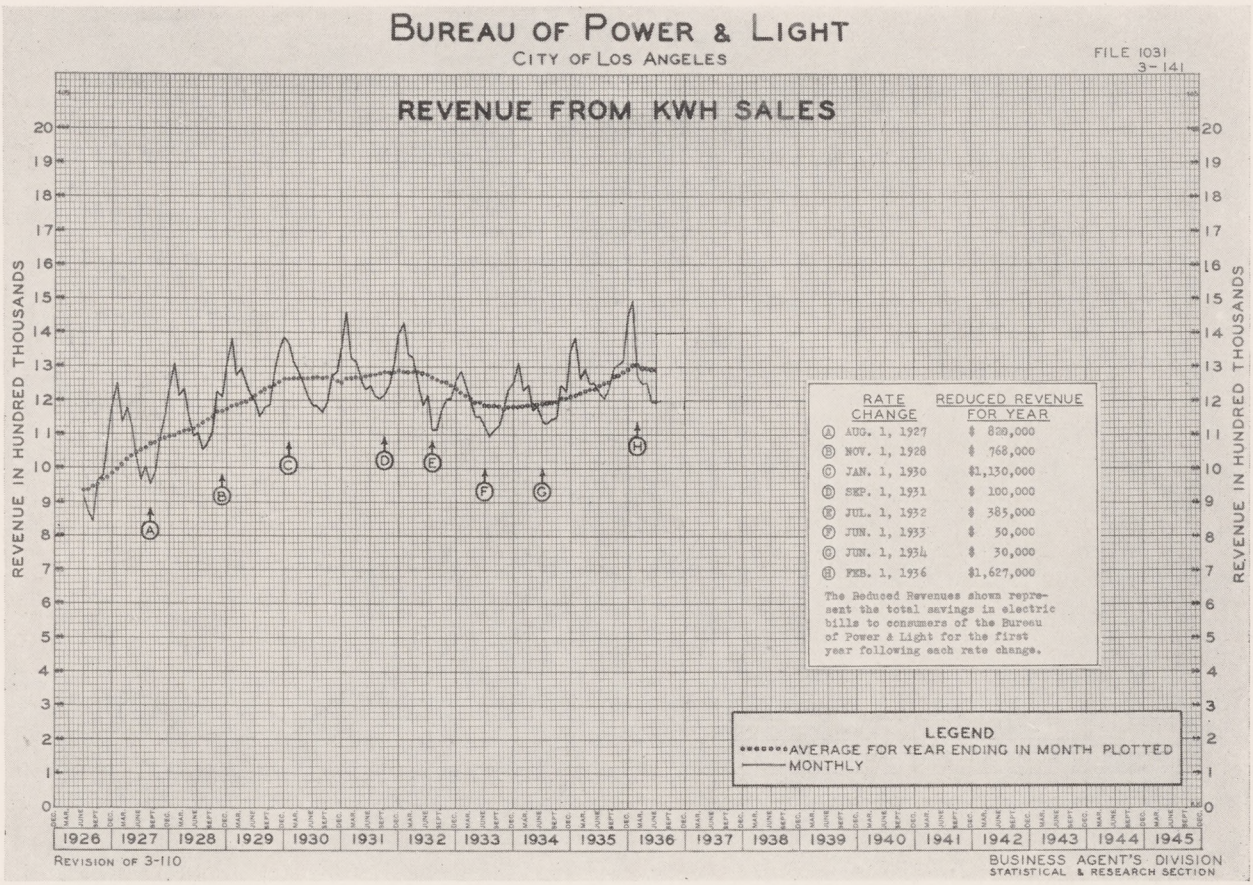
Special Promotional Work

The customary dealer training school, Bureau branch office display floor, local dealer meetings, Electric Cookery Council, cooperation with downtown department stores and local dealers, window displays, lectures before groups, and other related activities have been consistently maintained throughout the year.

FINANCE PLAN FOR CONSUMERS

The most important step toward promoting the purchase and use by consumers of electrical appliances was undertaken by the Department before the close of the year, through a proposed agency agreement with the Electric Home and Farm Authority of Washington, D. C. Under this arrangement it is anticipated that there will be made available to dealers, for the benefit of purchasers of equipment to be installed on lines of the Bureau of Power and Light, a system of financing at lower interest rate than now prevailing in the city, and with long term monthly payments, for heavy-duty appliances such as electric ranges and water heaters. It is also planned that the Department will provide for under-writing such consumer contracts as may be acceptable credit, thus relieving the dealer from burdensome contingent liabilities; the paper of which the dealer is relieved to be discounted and a fund set up for insuring losses through reversions. It is expected that details of this plan will be worked out early in the coming year, and result in greatly stimulating the use of electrical conveniences for the relief of the home maker.




BUREAU OF POWER & LIGHT
CITY OF LOS ANGELES
FILE 1031
3-141
REVENUE FROM KWH SALES
REVENUE IN HUNDRED THOUSANDS
RATE CHANGE
REDUCED REVENUE FOR YEAR
(A) AUG. 1, 1927 $ 829,000
(B) NOV. 1, 1928 $ 768,000
(C) JAN. 1, 1930 $1,130,000
(D) SEP. 1, 1931 $ 100,000
(E) JUL. 1, 1932 $ 385,000
(F) JUN. 1, 1933 $ 50,000
(G) JUN. 1, 1934 $ 30,000
(H) FEB. 1, 1936 $1,627,000
The Reduced Revenues shown represent the total savings in electric bills to consumers of the Bureau of Power & Light for the first year following each rate change.
LEGEND
AVERAGE FOR YEAR ENDING IN MONTH PLOTTED
MONTHLY
1926 1927 1928 1929 1930 1931 1932 1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945
REVISION OF 3-110
BUSINESS AGENT'S DIVISION
STATISTICAL & RESEARCH SECTION

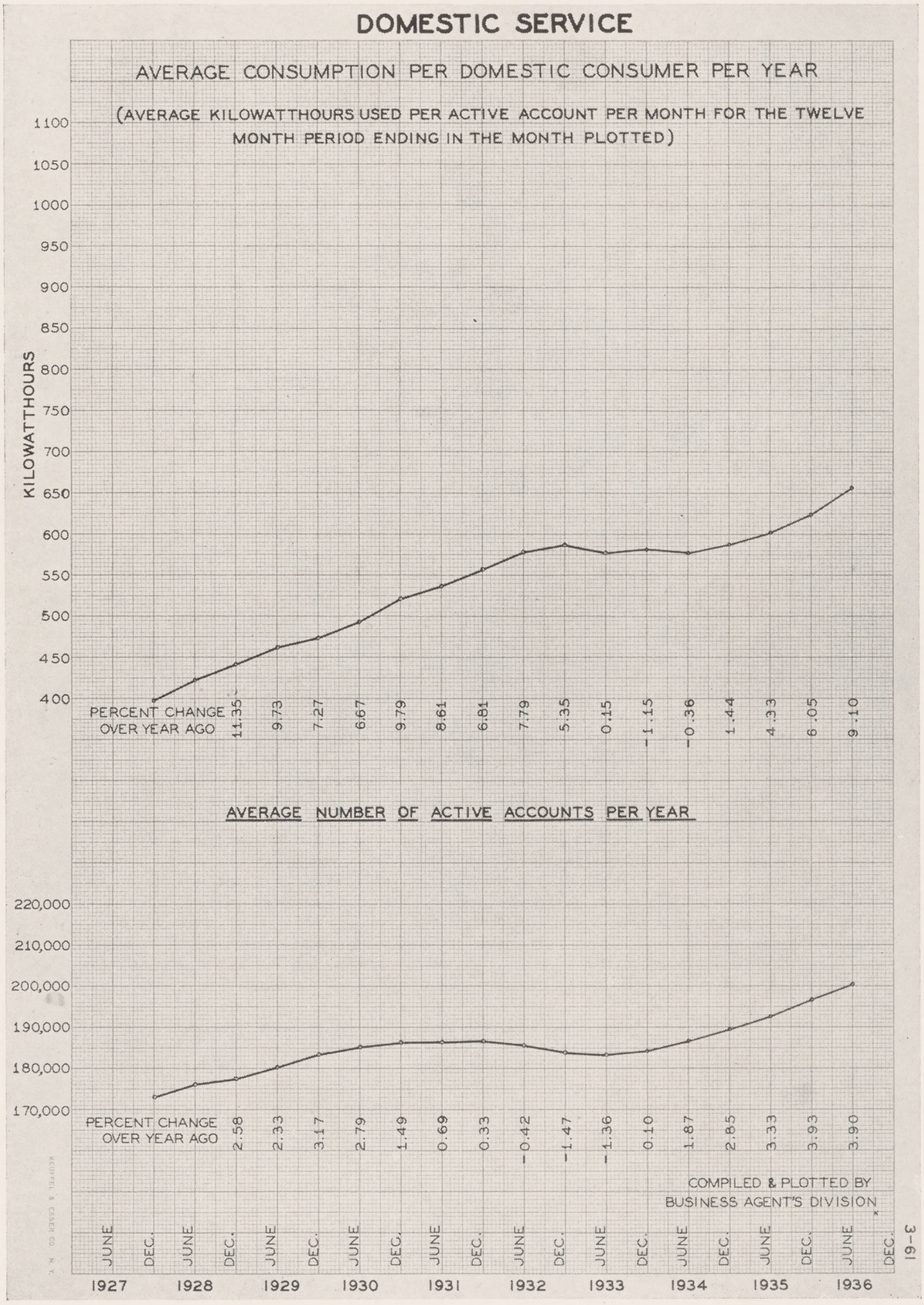

DOMESTIC SERVICE
AVERAGE CONSUMPTION PER DOMESTIC CONSUMER PER YEAR
(AVERAGE KILOWATTHOURS USED PER ACTIVE ACCOUNT PER MONTH FOR THE TWELVE MONTH PERIOD ENDING IN THE MONTH PLOTTED)
KILOWATTHOURS
1100
1050
1000
950
900
850
800
750
700
650
600
550
500
450
400
PERCENT CHANGE OVER YEAR AGO
11.35
9.73
7.27
6.67
9.79
8.61
6.81
7.79
5.35
0.15
-1.15
-0.36
1.44
4.33
6.05
9.10
AVERAGE NUMBER OF ACTIVE ACCOUNTS PER YEAR
220,000
210,000
200,000
190,000
180,000
170,000
PERCENT CHANGE OVER YEAR AGO
2.58
2.33
3.17
2.79
1.49
0.69
0.33
-0.42
-1.47
-1.36
0.10
1.87
2.85
3.33
3.93
3.90
COMPILED & PLOTTED BY BUSINESS AGENT'S DIVISION
JUNE
DEC.
1927
1928
1929
1930
1931
1932
1933
1934
1935
1936
3-61

TABLE "A"

COMPARATIVE STATEMENT
BASED ON METERS CONNECTED TO CONSUMERS' PREMISES

(As of June 30th Each Year)

SHOWING KILOWATT-HOURS AND REVENUE

(For Years Ending June 30th)

	1934	1935	1936
Lighting—Other Than Street Lighting:			
Total Meters	251,349	252,797	254,403
Change over previous year	Incr. 0.1%	Incr. 0.6%	Incr. 0.6%**
Total kilowatt-hours sold	239,864,694	255,664,499	305,314,261
Change over previous year	Decr. 2.8%	Incr. 6.6%	Incr. 19.4%**
Total revenue	$ 8,362,840	$ 8,833,317	$ 9,515,399
Change over previous year	Decr. 1.4%	Incr. 5.6%	Incr. 7.7%**
Street Lighting:			
Total kilowatt-hours sold	56,425,948	55,081,357	54,945,215
Change over previous year	Decr. 4.0%	Decr. 2.4%	Decr. 0.2%
Total revenue	$ 1,600,067	$ 1,555,036	$ 1,484,461
Change over previous year	Decr. 4.3%	Decr. 2.8%	Decr. 4.5%
Power:			
Total Meters	16,811	17,072	16,164
Change over previous year	Decr. 0.7%	Incr. 1.6%	Decr. 5.3%**
Total kilowatt-hours sold	280,621,358	290,154,445	333,974,713
Change over previous year	Incr. 7.0%	Incr. 3.4%	Incr. 15.1%**
Total revenue	$ 3,646,890	$ 3,748,286	$ 3,973,823
Change over previous year	Incr. 1.7%	Incr. 2.8%	Incr. 6.0%**
Combination Light and Power:			
Total Meters	1,414	1,280	*
Change over previous year	Incr. 42.8%	Decr. 9.5%	*
Total kilowatt-hours sold	53,333,678	61,921,151	*
Change over previous year	Incr. 25.5%	Incr. 16.1%	*
Total revenue	$ 674,529	$ 788,708	*
Change over previous year	Incr. 28.4%	Incr. 16.9%	*
All Uses Combined:			
Total Meters	269,574	271,149	270,843
Change over previous year	Incr. 0.2%	Incr. 0.6%	Decr. 0.1%
Total kilowatt-hours sold	630,245,678	662,821,452	736,548,438
Change over previous year	Incr. 3.3%	Incr. 5.1%	Incr. 11.1%
Total revenue	$14,284,326	$14,925,347	$15,494,598
Change over previous year	Incr. 0.2%	Incr. 4.5%	Incr. 3.8%

NOTES: Removal of idle meters from inactive service for adjustment to sixty cycle operation reduced meters in service to a sub-normal amount.

* Amounts or percentages are not given because they are not comparable with those of previous year. Due to change in rate schedule, effective February 1, 1936, figures represent sales for 7 months from July 1, 1935, to January 31, 1936, inclusive, for Combination Light and Power purposes, and in addition includes a small amount of sales as Standby to Private Plants for entire fiscal year.

** These percentages are abnormally large due to influence of discontinuance of Combination Light and Power classification as described above.

TABLE "B"

STATEMENT BASED ON ACTUAL CONSUMERS (ACTIVE ACCOUNTS)

SHOWING KILOWATT HOURS SOLD AND REVENUES

For Year Ending June 30, 1936

	Average Number Consumers	Total Consumption Kwhrs.	Total Revenue $
Light:			
Residential (Includes Residence Major Appliance Use)	200,370	131,849,136	4,670,101.15
Commercial	31,922	159,200,975	4,533,767.38
Governmental—City	635	8,266,663	207,565.73
Governmental—Other Agencies	154	4,180,672	71,652.28
Municipal Street	200	14,803,155	452,968.71
Ornamental Street	508	40,142,060	1,031,492.88
Other Department Charges	44	127,049	4,271.15
Used by Power Bureau	69	1,689,766	28,041.16
TOTAL LIGHT	233,902	360,259,476	10,999,860.44
Power:			
Commercial	10,551	95,870,070	1,665,450.95
Governmental—City	946	9,046,616	142,412.35
Governmental—Other Agencies	56	2,077,034	28,064.56
Industrial	2,142	215,351,228	2,019,628.79
Other Department Charges	45	7,045,117	79,214.62
Used by Power Bureau	90	4,584,648	39,051.49
TOTAL POWER	13,830	333,974,713	3,973,822.76
Combination Light and Power:			
Commercial	44	31,984,950	401,979.29
Governmental—City	1	1,242,250	14,493.94
Governmental—Other Agencies	4	7,450,144	81,549.57
Industrial	4	486,010	9,252.23
Used by Power Bureau	1	1,150,895	13,640.30
TOTAL COMBINATION	54	42,314,249	520,915.33
TOTAL LIGHT, POWER AND COMBINATION	247,786	736,548,438	15,494,598.53
METER RENTALS	.....	.....	12,356.31
GRAND TOTAL	247,786	736,548,438	15,506,954.84

Kwhrs. and Revenue from Sales to Owens Valley Light and Power System Not Included in Above.

NOTES: Being based on active accounts this table represents accurate data on the classified use of energy. The variation in total and average use from year to year (see Table "C") affords an excellent "Business Barometer".

Due to change in rate schedule, effective February 1, 1936, figures represent sales for 7 months from July 1, 1935, to January 31, 1936, inclusive, for Combination Light and Power purposes, and in addition includes a small amount of sales as Standby to Private Plants for entire fiscal year.

TABLE "C"

STATEMENT BASED ON ACTUAL CONSUMERS (ACTIVE ACCOUNTS)

SHOWING AVERAGE MONTHLY USE OF ENERGY

(For Years Ending June 30th)

CLASSIFICATION	1934	1935	1936
Light:			
Residential (Includes Residence Major Appliance Use)			
Average number of consumers	186,624	192,840	200,370
Change over previous year	Incr. 1.9%	Incr. 3.3%	Incr. 3.9%
Average monthly consumption in kwhrs	48.2	50.3	54.8
Change over previous year	Decr. 0.2%	Incr. 4.4%	Incr. 8.9%
Average monthly bill	$ 1.87	$ 1.91	$ 1.94
Change over previous year	Decr. 0.5%	Incr. 2.1%	Incr. 1.6%
Commercial (Includes Governmental)			
Average number of consumers	31,663	32,122	*
Change over previous year	Decr. 0.8%	Incr. 1.4%	*
Average monthly consumption in kwhrs	343.7	358.7	*
Change over previous year	Decr. 5.0%	Incr. 4.4%	*
Average monthly bill	$10.90	$11.38	*
Change over previous year	Decr. 3.3%	Incr. 4.4%	*
Power:			
Commercial (Includes Governmental)			
Average number of consumers	11,046	11,223	*
Change over previous year	Incr. 1.0%	Incr. 1.6%	*
Average monthly consumption in kwhrs	723.1	738.3	*
Change over previous year	Incr. 1.8%	Incr. 2.1%	*
Average monthly bill	$13.11	$13.25	*
Change over previous year	Decr. 1.3%	Incr. 1.1%	*
Industrial			
Average number of consumers	2,305	2,203	2,142
Change over previous year	Decr. 2.5%	Decr. 4.4%	Decr. 2.8%
Average monthly consumption in kwhrs	6,241.2	6,803.6	8,378.1
Change over previous year	Incr. 13.4%	Incr. 9.0%	Incr. 23.1%
Average monthly bill	$64.83	$69.97	$78.57
Change over previous year	Incr. 6.9%	Incr. 7.9%	Incr. 12.3%

* Amounts or percentages are not given because they are not comparable with those for previous years due to discontinuance of Combination Light and Power Classfiication, February 1, 1936.

TABLE "D"

SUMMARY OF POWER SERVICE AND CONNECTED HORSEPOWER

BUSINESS OR USE CLASSIFICATION

As of June 30, 1936

CLASSIFICATION	Active Services	% Change Over Previous Year	Active Horsepower	% Change Over Previous Year
Agriculture and Irrigation	135	Incr. 10.7	5,137.28	Incr. 21.1
Amusements and Recreations (Includes Motion Picture Production)	254	Incr. 7.6	38,962.60	Incr. 24.5
Automotive	2,045	Incr. 0.04	10,366.27	Incr. 5.2
Building and Housing Materials—Appliances and Construction	259	Incr. 7.5	17,665.37	Incr. 23.3
Buildings: (Apartments, Flats, Churches, Hospitals, Sanitariums, Hotels, Clubs, Offices, Loft and Public Buildings, Schools, Stores, etc.)	3,965	*	77,700.68	*
Cleaning and Dyeing and Laundries	242	Decr. 2.0	7,328.51	Decr. 19.0
Electro-Chemical	44	Decr. 4.3	1,513.63	Incr. 6.6
Food Products: (Includes Ice Cream Mfg. and Wholesale Refrigeration, Bakeries, Creameries, Grain Mills, Meat Packers, Restaurants, etc.)	3,035	Incr. 2.3	58,972.32	Incr. 1.4
Miscellaneous Shops and Manufacturing: (Includes Tire and Rubber Products, Oil Development, Road Building Materials, etc.)	1,940	Incr. 4.1	92,085.94	Incr. 1.2
Metal Working	668	Decr. 3.7	39,811.40	Incr. 9.7
Printing	335	Decr. 5.9	9,441.26	Decr. 8.0
Residential—Miscellaneous Power	86	Incr. 2.4	519.35	Incr. 7.2
Textile Mills: (Includes Cotton, Silk, and Woolen Mills)	6	Incr. 50.0	708.47	Incr. 69.1
Transportation: (Includes Docks and Wharfs, Ship Building, Freight Yards and Stations)	54	Incr. 3.8	11,320.28	Decr. 2.4
Wearing Apparel	535	Incr. 0.6	2,621.67	Incr. 5.0
Woodworking	347	*	21,300.46	*
All Others: (Emergency, Temporary and P. of E.)	195	----------	50.50	----------
TOTAL FOR SYSTEM	14,145	Incr. 2.5	395,505.99	Incr. 10.0

NOTES: Residential Major Appliance Load is tabulated separately under Table "E".

* Percentages are not given because amounts are not comparable with those of previous year due to influence of discontinuing Combination Light and Power Classification February 1, 1936.

TABLE "E"

RESIDENTIAL MAJOR APPLIANCE LOAD

SUMMARY OF SERVICES, CONNECTED LOAD AND USE

As of June 30, 1936

			% Increase Over Previous Year	
			No.	H.P.
5,864	Active Services with Connected Load of	67,503.23 HP	19.8%	30.4%
4,564	Ranges with Connected Load of	54,392.41 HP	25.5%	31.8%
1,186	Water Heaters with Connected Load of	5,248.21 HP	45.5%	45.9%
2,933	Space Heaters with Connected Load of	6,977.52 HP	10.3%	15.6%
	Miscellaneous	885.09 HP	----------	0.3%

TABLE "F"

TOTAL SYSTEM CONNECTED LOAD

As of June 30, 1936

	Kilowatts	Horsepower
Power (Exclusive of Major Residential Appliances for Heating, Cooking and Water Heating)	294,889.27	395,505.99
Residential Major Appliances	50,330.41	67,503.23
Street Lighting	14,597.59	19,578.31
Other Lighting and Miscellaneous	440,346.65	590,593.68
TOTAL	800,163.92	1,073,181.21

Commercial Division

S. K. DECKER, *Director*

THE following tabulations which relate to principal functions of the Commercial Division, for the fiscal year 1935-36, appear in the same order as in the annual reports for several years past:

CONSUMERS' SERVICE SECTION

	This Year	Last Year
Water Contracts received—new installations	2,327	950
Light Contracts received—new installations	2,513	1,533
Power Contracts received—new installations	988	851
Water Turn-on orders—service already installed	17,593	17,531
Light and Power Turn-on orders—service already installed	69,385	72,774
Water Closing bills ordered—off orders	22,588	23,530
Water Closing bills ordered—read orders	12,899	11,481
Electric Closing bills ordered—off orders	73,592	76,197
Electric Closing bills ordered—read orders	18,182	15,918
Total all Closing bills ordered	127,261	127,126

METER READING AND RECORD SECTION

Electric Meters read—Los Angeles District	2,688,541	2,688,737
Water Meters read—Los Angeles District	2,518,854	2,498,759
Electric Meters Set—all districts	14,797	8,230
Electric Meters removed—all districts	15,103*	6,655
Total Electric Meters in service June 30, 1936	270,843*	271,149
Total Water Meters in service June 30, 1936	259,499	253,976
Electric Turn-on orders completed—all districts	87,072	93,097
Electric Turn-off orders completed—all districts	81,588	86,299
Electric Closing-read orders completed—all districts	21,829	19,461
Miscellaneous Memo orders completed—all districts	31,111	29,081
Miscellaneous Electric Complaints completed—all districts	59,503	56,365

* The increase in meters removed and total in service showing decreases is due to inactive meters being removed during the cycle change.

BILLING AND ADDRESSOGRAPHING SECTION

Addressograph Stencils cut	345,047	334,950
Consumers' Bills addressographed		
Regular Bills	5,289,659	5,399,659
Closing Bills	141,177	145,666
Field Collection Bills	424,787	343,157
Courtesy Notices	1,502,556	1,704,209
Total Bills and Courtesy Notices addressographed	7,358,179	7,592,691
Regular Bill Ledger Cards key-punched, sorted, tabulated and printed	5,256,842	6,074,836
Orders progressed through reading books	370,696	330,366

IRRIGATION ACCOUNTS, SAN FERNANDO VALLEY

Accounts Outstanding, September 30, 1936	$ 46,644.78	$ 44,484.62
Earnings for Season ending September 30, 1936	506,489.60	397,219.88
Collections and Miscellaneous Credits for Season ending September 30, 1936	503,977.50	395,059.72
Accounts Outstanding, September 30, 1936	49,156.88	46,644.78

BOOKKEEPING SECTION

	This Year	Last Year
Water Earnings, Consumers' Accounts	$ 9,550,666.28	$ 8,874,826.75
Electric Earnings, Consumers' Accounts	15,505,431.88	14,936,957.95
Total Earnings, Consumers' Accounts	25,056,098.16	23,811,784.70
Water Sales, Consumers' Accounts, including irrigation, cu. ft.	10,773,219,300	9,158,569,400
Electric Sales, Consumers' Accounts, K.W.H.	736,464,221	662,621,452
Water Consumers' Accounts, outstanding as of June 30, 1936	$ 717,111.60	$ 733,057.06
Electric Consumers' Accounts, outstanding as of June 30, 1936	823,665.28	884,608.91
Total Outstanding Consumers' Accounts as of June 30, 1936	1,540,776.88	1,617,665.97
Telephone Inquiries re Consumers' Accounts	77,885	86,752
Duplicate Bills supplied Consumers'—Main Office only	68,171	76,416

MAILING SECTION

Pieces of Mail Received	1,036,859	908,988
Regular Bills Mailed	5,345,569	5,232,553
Closing Bills Mailed	100,775	117,254

COLLECTION SECTION

Counter Collections—Main Office	$ 2,680,327.49	$ 2,770,204.87
Mail Collections—Main Office	11,786,286.70	10,848,075.98
Collections, Branch and Distrtict Offices	7,209,025.21	6,562,904.56
Collections made by Field Collectors	717,888.42	811,276.32
Field Collection Calls Made	214,703	280,207
Collection Courtesy Notices Mailed	1,502,556	1,704,209
Collection Letters Mailed	96,970	100,403

SPECIAL ACCOUNTS SECTION

Consumers' applications checked and approved	19,279	27,515
Credit investigation files progressed	37,194	23,325
Property checks covering guarantees	2,354	9,265
Deposits taken—2499 for	$ 70,049.00	$ 61,076.26
Judgments secured—70 for	14,667.68	9,266.63
Collections on judgments	1,541.94	2,220.24
Bankruptcy cases	76	102
Receiverships, Trusteeships and Assignments	103	90
Escrows: Amount of bills filed	$ 16,215.06	$ 11,325.00
Amount collected	9,324.44	8,545.12

Attention is called to the tabulation below showing the trend of our write-off to bad debts, starting with the fiscal year 1929-30, and closing with the fiscal year just ended. Our write-off for 1930-31 was less than for 1929-30, 1931-32. The fiscal year 1932-33 shows a marked increase, which was during the worst years of the depression.

During 1933-34 our write-off started to decrease with a marked continuing decrease during 1934-35 over 1933-34.

The fiscal year just ended shows our charges to bad debts to amount to only $26,380.06, or .10738% of the year's revenues. This year's percentage of .10738, as compared to the average for the previous six years of .3235% indicates that not only our collection methods have been improved and have been very effective without the necessity of an arbitrary deposit plan, but it also indicates a marked improvement in the general economic conditions in this community.

Fiscal Year	Total Earnings	Total Charged to Bad Debts	Water % Write-off	Electric % Write-off	Total % Write-off
1935-36	$24,566,362.72	$26,380.06	.07819	.12444	.10738
1934-35	23,452,659.72	46,334.99	.153	.223	.198
1933-34	23,057,766.67	75,625.42	.263	.368	.328
1932-33	22,932,715.85	96,842.05	.333	.477	.422
1931-32	24,331,247.83	98,132.93	.311	.457	.403
1930-31	24,405,802.83	69,508.03	.155	.362	.285
1929-30	24,190,309.75	73,945.76	.154	.395	.305

FIELD INVESTIGATION SECTION

	This Year	Last Year
Water service investigation, requested by consumers, and voluntary investigations of high water bills	23,385	27,435
Miscellaneous investigations, including presentation of corrected and adjusted bills. This year's total of 3,978 includes investigations of applications for charity water, individuals, for Social Service Department, listed separately last year	3,978	1,938
Investigations satisfactorily completed by telephone	1,290	3,113
Investigations satisfactorily completed by correspondence	3,610	5,090
Total investigations satisfactorily completed in the field, and by telephone and by correspondence	32,263	39,844
Number of charitable institutions receiving discounts on water and electric service bills	87	85
Number of service bills to charitable institutions receiving discounts	2,785	2,904
Amount of discount allowed from ordinance rates to charitable institutions at the request of the Social Service Department—		
Water	$ 33,842.42	$ 30,678.16
Electric	15,727.88	15,146.28
Total number of water service bills for indigent families receiving discounts on water service bills at the request of the Social Service Department during the year	584	9,302
Amount of discounted water service bills to indigent families as recommended by the Social Service Commission and paid from funds appropriated by this Department to the Social Service Department, through the City's General Fund	$ 850.90	$ 14,493.79

RENTALS, DEPARTMENT OWNED PROPERTY, LOS ANGELES DISTRICT

Rental Charges, September 30, 1936	$ 58,346.12	$ 55,115.23
Collections, September 30, 1936	57,972.04	51,671.81
Percentage of Collections to Charges	99.4%	93.8%

CASHIER'S SECTION

Cash Receipts—Water (Consumers' Accounts)	$ 9,725,418.26	$ 9,090,564.10
Cash Receipts—Power (Consumers' Accounts)	14,345,948.71	13,111,248.04
Total Cash Receipts (Consumers' Accounts)	24,071,366.97	22,201,812.14
Average Monthly Cash Receipts	2,005,947.25	1,850,151.01
"N. G." Checks Received	2,377	2,620
Amount of "N. G." Checks Received	$ 31,063.81	$ 38,067.42
"N. G." Checks Uncollected as of June 30, 1936	232.66	198.05

Purchasing Division

D. P. NICKLIN, *Purchasing Agent*

THE work of this Division for the past year was characterized by the receipt of an unusually large number of requisitions and the issuance of a correspondingly large number of requests for bids and of purchase orders. This was caused by the requirements of the work of changing the frequency in the electrical system of the Bureau of Power and Light from 50 to 60 cycles and by the approaching completion of the construction of Boulder Canyon Power Transmission Line, a condition which, on a job of such great magnitude, always entails the making of a large number of small purchases.

A recapitulation of purchasing activities for the year 1935-36 follows.

A total of 16,509 requisitions for material, equipment and supplies were received which made necessary the issuance of 40,942 written and 23,767 telephonic requests for bids, which represents an increase of 22% over the number for the previous year. In response to bids received, 25,378 purchase orders involving an expenditure of $2,717,895.81 were issued and 219 contracts involving the expenditure of $3,095,489.84 were executed. In addition, 36,710 sub-purchase orders were issued involving an expenditure of $2,795,870.68. There were 1552 informal contracts issued, which are limited to the expenditure of $2,000.00 each. The total estimated contingent liability resulting from the above mentioned purchase orders and contracts amounted to $8,609,256.43. While the total number of purchase orders issued was 13 per cent greater than for the year next preceding, the total amount expended during the year for material, equipment and supplies was approximately 24 per cent less.

Some of the major purchases and amounts involved are listed below:

Hardware, Building and Shelf	$ 81,744.12
Metals, Ferrous	130,270.81
Metals, Non-ferrous	88,610.67
Acids, Paints, Glass, Oils, Greases, etc.	366,740.36
Building Materials	278,265.54
Transportation, Equipment, Parts and Accessories	329,755.54
Diesel Tractors, Track Wagons, Portable Gravel Plant, Battery Locomotives, Traveling Crane	108,296.98
Transformers, Regulators and Parts	260,653.46
Frequency Change Materials	248,528.00
Pipe and Fittings	2,291,792.66
Conduit and Fittings	101,811.72
Wire and Cable	294,435.19
Insulators and Insulating Materials	75,869.34
Furniture and Office Equipment	104,326.70
Camp, Mess and Commissary Supplies	196,588.91
Rentals and Services	69,917.43
Switchboard and Bus Structure Materials	38,011.67
Meters and Parts	423,345.28
Lamps, Incandescent	87,864.12
Tools, Hand and Mechanical	119,054.55
Machinery, Power Driven and Parts	321,650.38
Switches, Control Apparatus and Parts	172,107.34
Line Construction Materials	101,238.16
Electrical Equipment, Protective Devices and Supplies	117,927.08
Telephone Apparatus and Equipment	281,101.43
Commercial Office Building	25,273.00
Valves	101,863.43
P. W. A. Contracts for Construction Work	215,586.85

The Specifications Section of this Division submits the following data pertaining to its work:

Standard Specifications prepared: new, 21; revised and rewritten, 110. Advertised Specifications, 340. Temporary Specifications not advertised, 185. Schedules: new 27; revised 33. Standard Wordings, 15.

The Salvage Section of the General Plant Division submitted the necessary data for use in disposing of 80 different lots of salvaged material and equipment, which necessitated the sending out of 677 requests for bids, and the tabulations of the bids received. From the sale of such salvage material, a total of $35,858.95 was realized and turned over to the Controller of the Department.

The Traffic Section gave attention to the routing of all rail, water and outside truck shipments for the Department. It has successfully negotiated with common carriers for more advantageous rates on the Department's shipments. Seven hundred transportation orders were issued. In addition tickets were obtained and itineraries arranged for all employees traveling on official business. Arrangements were made for special busses for conveying laborers and skilled mechanical workers to construction camps. Overcharge and loss and damage claims, amounting to approximately $8,000.00 were handled; also refunds on unused portions of rail and bus tickets, amounting to $741.77, were secured by this Section.

General Plant Division

C. O. WEST, *Executive Assistant in Charge*

FOLLOWING is a report of the activities of the General Plant Division for the fiscal year ending June 30, 1936:

This period continued to show a marked increase over previous years in the activities of the General Plant Division, due to the magnitude and importance of construction projects being progressed by both Bureaus of the Department.

Major Power Bureau activities which affected this Division included the construction of the Boulder Transmission Line, the enlarging and modifications of Receiving Stations "A", "B", and "C", and the preparation for changing station and power plant equipments for operation on the new system frequency of sixty cycles.

The major activities of the Water Bureau which affected the General Plant Division were the Mono Craters, Grant Lake, and Long Valley projects in the Mono Basin and various WPA projects. The demands occasioned by regular water and power system maintenance also increased with the continued growth of the Department.

During the year this Division was assigned the work of building maintenance which consists principally of plumbing, painting, carpentry and repairs to elevators, ice machines, vacuum tube systems, and other equipment attached to and considered a part of the Department's office buildings.

On October 14, 1935, the General Plant Division was assigned the task of changing all Power Bureau consumers' equipment for operation on the new sixty cycle frequency, with the exception of synchronous clocks and elevators. Organization procedure preparations were made to handle this work, consisting of approximately 45,000 industrial consumers' equipment, varying in size from ¼-H.P. to 750-H.P., that are to be cycle changed concurrently with the Power Bureau's system change of frequency which calls for making the entire change in 14 successive cuts in an elapsed time of less than 4½ months.

To care for the vast amount of work involved in this major project, the Frequency Change Section of the General Plant Division was organized and established in a building containing 70,000 square feet of floor space leased and equipped for this purpose.

FREQUENCY CHANGE SECTION

A thorough survey was made of all electrical appliances and equipment in use by consumers on the system of the Bureau of Power and Light, including all domestic, commercial and industrial uses, which would require changes necessary for satisfactory operation at 60 cycle frequency. This was an enormous undertaking but by June 30, approximately 90 per cent of the field surveys, and 65 per cent of the engineering had been completed; 20 per cent of necessary materials had been ordered, 8 per cent received, and the total tool requirements had been forecast, including the design of special rigging equipment and portable tripods for deep well pumps. The Frequency Change Section was in a good position by the end of the fiscal year to successfully progress their assignment for the following fiscal year, of over 300 completed jobs per day, seven days a week, continuously for almost five months.

ELECTRICAL REPAIR SECTION

The Electrical Repair Section continued its service to all Divisions of the Department wherever electrical repair work or fabrication of electrical equipment was needed.

During the fiscal year, 5300 assignments were completed. Of the 76 power house and distributing station assignments, one of particular interest was the improving of the two 3500 Kw Francis turbines at Haiwee Power Plant. Metalized stainless steel case and runner wearing rings were installed, which reduced crown plate pressures from 22 lbs. per sq. in. to a 6 in. vacuum, with resultant increased efficiencies, and reduced thrust bearing temperatures. Special tools and technique were developed for this work. At Power Plant No. 1 ten 3150 Kva, 110 Kv transformers were rebuilt and improved with nitrogen equipment, which included specially designed two-compartment expansion tanks. At Receiving Station "A", the 80-ton rotor of the 25,000 Kva synchronous condenser was disassembled and the pole pieces completely rebuilt with new steel end plates and pole caps.

Of the twenty power transformers at Station "A" to be rebuilt in connection with the Power Bureau's system change in frequency, fourteen, varying in size from 7000 to 20,000 Kva, were completed.

Many special pieces of equipment were designed or redesigned and fabricated during the year by the Repair Section. Among these were seven multi-tap potential transformers with specially designed rotating selector switches, all of which were mounted integrally with each of the seven 20,000 Kva tap changing under-load power transformers at Receiving Station "A", and so arranged that the taps of the potential transformers are changed synchronously with the taps of the power transformers to insure accurate ratios for metering purposes.

Included in more than 1700 transformers listed are three 1500 Kva and one 600 Kva water-cooled transformers, which were re-designed for self-cooled operation. Also in the year's total activities is included the rebuilding, partial re-designing, and restoring to permanent service of twenty-five 72 Kva induction regulators, which would have been shortly inoperative, due to obsolescence. This resulted in a saving to the Department over the purchase of new equipment f. o. b. Los Angeles of approximately $40,000.00.

Many items of special equipment were built for the Mono Basin project. More than twenty 2200-volt tunnel distribution cabinets, twenty portable 2200-volt sub-stations, and approximately 100 dry type transformers, varying in size from 3 Kva to 25 Kva, were designed and fabricated. Two 4-ton electric locomotives and one electric shovel were reclaimed from salvage and rebuilt for the project.

The Switchboard Shop successfully progressed the additional work assigned to them, including the switchboard equipment for the distributing stations at Eagle Rock and the Palisades; for the switching stations at Silver Lake and Victorville, and for Receiving Stations "A", "B", and "C".

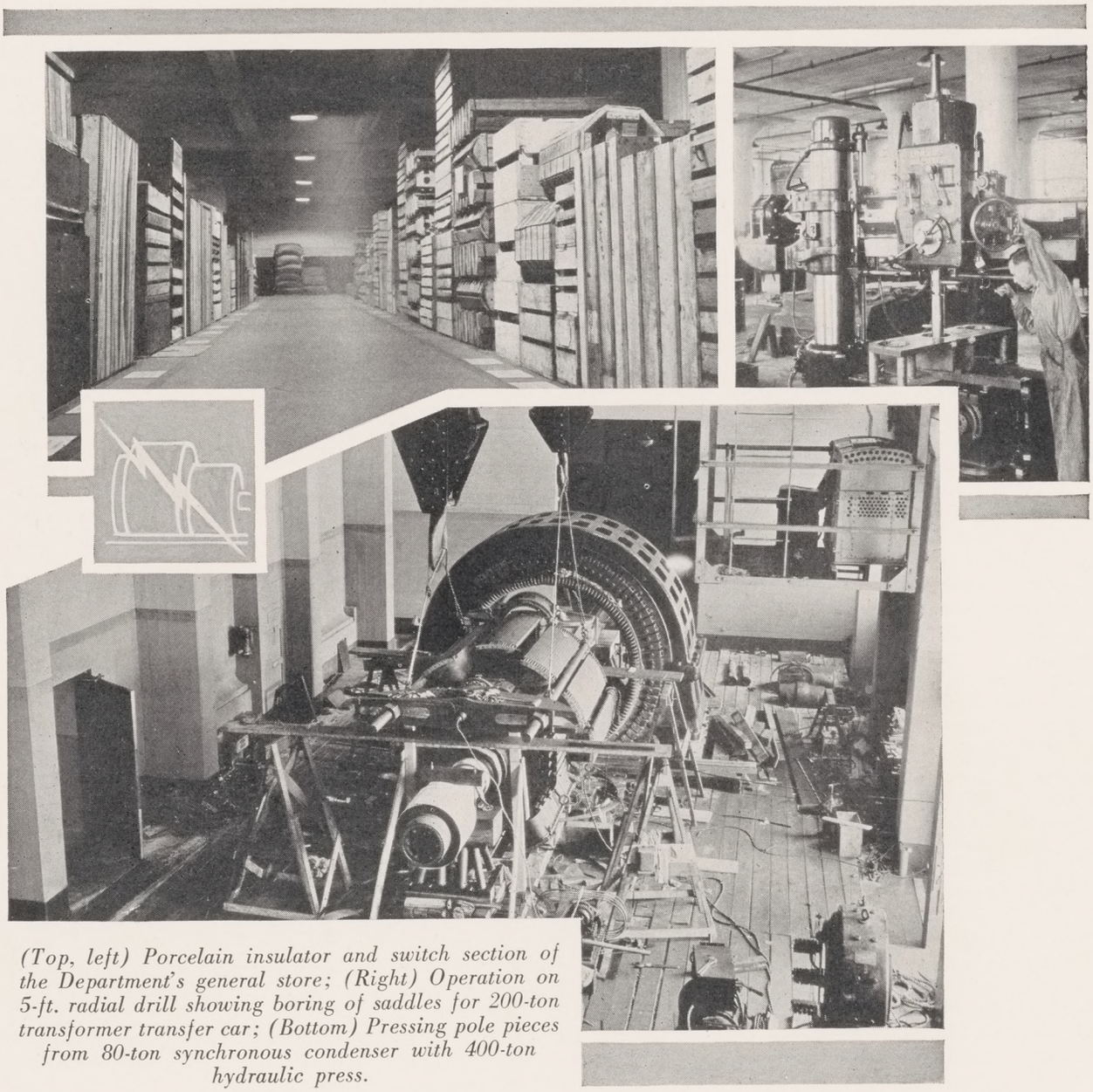
Regular inspection trips were made to Boulder Canyon Power Plant to assure that generating equipment was being furnished and assembled according to specifications, and also to familiarize the personnel of the Electrical Repair Section with details of this equipment for future maintenance work.

A power driven squaring shears and a monorail system, serving the winding lathes and assembly floor of the second floor, were added to the shop equipment during the year to more efficiently progress work.

MACHINE SHOPS SECTION

The Machine Shops Section, which includes the carpenter, paint, structural steel, blacksmith, sheet metal, welding, plumbing, and the general machine shops, completed more than 15,000 jobs during the year, which is an increase of 90 per cent over the previous year. To more efficiently handle the increased volume of work, several items of new equipment were added, including a 24-inch geared head lathe and a 10-ft. press brake.

A review of the major jobs completed during the year indicates the following assignments to be of special interest: A 200-ton transfer car was fabricated for moving the large transformers at Receiving Station "B". Precision jobs included the remodeling of two tabulating machines and the building of two 80-column tabulating card-punching devices.



(Top, left) Porcelain insulator and switch section of the Department's general store; (Right) Operation on 5-ft. radial drill showing boring of saddles for 200-ton transformer transfer car; (Bottom) Pressing pole pieces from 80-ton synchronous condenser with 400-ton hydraulic press.

Fabrications for the Mono Basin Project included one 3½-ton bulldog drill carriage for driving tunnels; one 240-ft. collapsible cement gun for cementing tunnels, and a 12½-ft. diameter cutting shoe for cutting the outlet valve at Grant Lake Reservoir. Also, three special 2500 GPM vertical mop-up pumps were mounted for West Portal Tunnel, and more than fifty overhaul jobs were completed on centrifugal pumps.

More than 450 tons of steel were assembled into various types of structural members for the receiving and distributing stations, and approximately 350 tons of steel were used to fabricate special tower members, angles, and plates for the Boulder Transmission Line.

More than 1000 jumper loop connectors were built and several hundred dead end and cable joint connectors were re-worked for the Boulder Transmission Line.

Work on automotive equipment included the construction of two special steel truck bodies, completely equipped with tool boxes and compartments. Also, 1476 body and fender repair jobs were completed.

One special metal body was fabricated and installed on a 5-ton truck, including the mounting of air compressor, air receivers and gasoline engine which are used to repair and re-paint street lighting equipment.

One special transmission was produced for a ditch-digging machine. This transmission makes it possible to use the dirt conveyor from either side of the road, a feature that has increased the efficiency of the machine approximately 20 per cent.

TRANSPORTATION SECTION

During the year the Transportation Section supplied transportation for all the Divisions and projects of the Department.

At the close of the year there were in operation 1255 units of transportation equipment, an increase of 3.4 per cent over the previous year. The total number of miles run during the year was 15,438,301, an increase of 6.1 per cent over the previous year, with an average mileage per passenger car of 14,506, and 11,342 for trucks, or an average of 12,396 miles per vehicle.

The tonnage moved by the Transportation truck fleet was 135,135 tons, of which 72,880 tons were moved from Los Angeles to the Boulder Transmission Line, and between points along the route of the line, and 9,039 tons from Los Angeles and San Pedro to the Mono Craters Tunnel, Long Valley and Grant Lake Reservoir Projects. These figures do not include tonnage moved by trucks assigned to various Divisions, such as Overhead, Street Mains and Underground. The year's hauling by the Transportation Section Pool Fleet, exclusive of assigned trucks, aggregaetd 3,510,769 ton miles.

To care for the unusually heavy demands for automobiles and trucks, a number of special contracts have been executed during the year. The most important of these was for the hauling of a large synchronous condenser to its position at Station "B". The largest piece weighed 196,000 pounds, which is believed to be the heaviest load ever hauled in this region.

During the year the Transportation Section purchased and put into service 135 passenger cars, 38 trucks, and 10 trailers, including one 60,000 lb. capacity tractor semi-trailer unit, and most of these purchases involved "turn-ins" of obsolete vehicles.

The daily bus service established between Los Angeles and the Mono Craters Tunnel Project has operated continuously throughout the year. An average of 116 automobiles and trucks were assigned to continuous duty on the Mono Craters Tunnel, Long Valley and Grant Lake Reservoir Projects. An average of 174 automobiles and trucks were assigned to continuous duty along the Boulder Transmission Line.

AUTOMOTIVE SHOPS SECTION

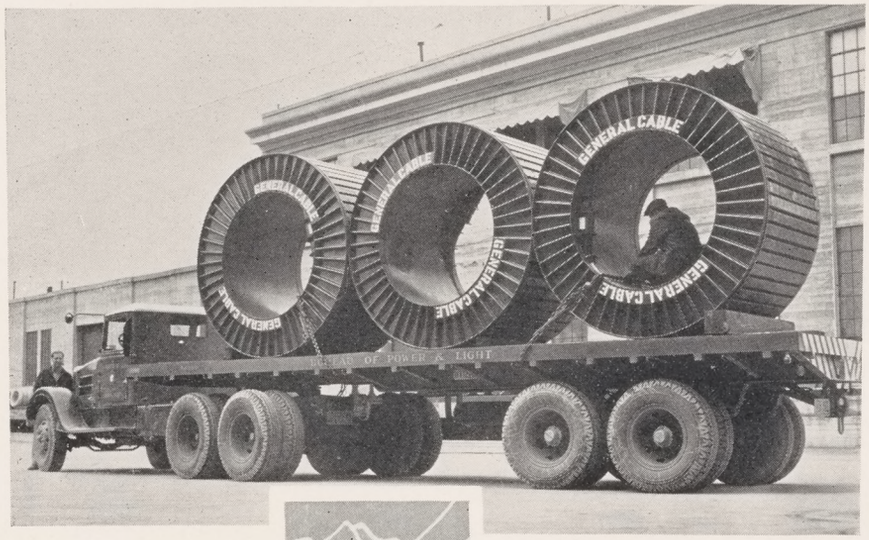
The Automotive Shops Section continued to perform the maintenance and repair work on all automobiles and trucks owned by the Department.

A total of 22,320 jobs were completed, including the following: 29 automobiles and trucks were completely overhauled; 398 light-duty and 171 heavy-duty motors were reconditioned; 128 light-duty and 91 heavy-duty differentials were overhauled; 549 brake relining and overhaul jobs were completed; power braking units were installed on many pieces of equipment used on various projects, where it is imperative that reliable braking mechanisms be maintained at all times; approximately 7320 electrical units, including starters, generators, magnetos, distributors and ignition systems, were repaired and overhauled by the electrical section of the Automotive Shops; the upholstery shop completed 3126 jobs, including the fabrication of 194 new tops and the dressing of 469 tops; numerous fabrications and repairs of aprons, bags, cushions, and tarpaulins were completed for various Divisions; approximately 5000 sq. yards of canvas and 1350 sq. yds. of upholstery material were used in this work.

The Automotive Shops Section is continually making investigations in cooperation with the Division's Engineers, to improve the mechanical and operating conditions of the Department's automotive equipment. Studies of air cleaners and other appurtenant parts of motors were made and their effect on operation, fuel consumption, crankcase dilution and engine wear was noted. As a result of these studies, all new automotive equipment purchased by the Department is thoroughly tested for proper carburetion, oil pressure, timing and mechanical defects, before it is put in service. The Department has received, without cost, many valuable replacements from dealers, including complete motor assemblies, since this system was put into effect.

CONSTRUCTION EQUIPMENT SECTION

During the year the Construction Equipment Section has cooperated with other Divisions of the Department in selecting and procuring construction equipment suitable for their particular needs, and has coordinated the movement of equipment between projects in such a way as to utilize the equipment available to best advantage. Careful observation of the operation of equipment and the continued application of preventive



(Left) Sixty thousand pounds gross capacity tractor truck with semi-trailer loaded with 15 tons of copper conductor for Boulder Transmission Project.

(Right) Diesel "75" tractor, with 12-yard dump wagon, working under power shovel at Grant Lake Dam unit of the Mono Basin Water Project.

maintenance have resulted in a reduction of delays due to failures, and have improved the efficiency of construction equipment.

The Construction Equipment Shop serviced, tested, and put into service 198 new units of equipment during the year. The major new units consisted of 3 electric tunnel locomotives, one 14 cu. ft. concrete placer, 114 pumps, a Fresno scraper, two 12 cu. yd. carryall scrapers, 8 large blowers, one steam boiler, one 36-ton sand and gravel bin, one 100 cu. yd. per hour rock crushing and screening plant; two 8 cu. yd. dump wagons, four 75 h. p. Diesel tractors, 8 clay diggers, two oil furnaces, one earth borer pole setting rig, 14 hoists, one lathe, and 70 electric and pneumatic shop and field tools.

The construction forces of the Department have, on many occasions, called for pieces of equipment not available from within the Department. Such requirements have been filled by rentals and the work of procurement has become a major item in the duties of this Section. During the year one power shovel, two road rollers, six cranes, three pumps, seven hoists, two compressors, two cement mixers, one carryall scraper and tractor, and 13 smaller units were rented and put into service.

In handling the regular inspection and maintenance work, the section completed 1,058 shop jobs.

STORES SECTION

The Stores Section provided services for all Divisions of the Department in obtaining commodities during the year 1935-36, the total receipts and issues of the Stores materials being as follows:

	Receipts	Issues
Power Revenue Fund	$3,830,990.00	$3,568,164.00
Water Revenue Fund	1,493,876.00	1,409,583.00
W. W. Bond Election 1930 Fund	617,212.00	609,922.00
P. T. C. R. Fund	135,365.00	133,808.00
Total	$6,077,443.00	$5,721,477.00

The total value of material received exceeded the total value of material issued by $355,966.00.

The balance on hand as of June 30, 1935, was $1,934,252.00 which, compared with that of June 30, 1936, of $2,327,657.00, shows an increase in the value of material of $393,405.00, or 20.34 per cent between the first and end of the period. This increase in the balance on hand is due to expansion of business and stocking for frequency change cut-over, together with purchases of certain commodities over and above our normal requirements, in order to take advantage of a low market before advance in prices became effective.

The expansion in business and consequential increase in the value of Material on Hand is substantiated by the additional volume of receipts and issues, which reflects a $2,744,842.00, or 30-1/3 per cent increase over the preceding year. Notwithstanding the fact that the volume of material handled increased, the increase in labor expense for the period was $832.00, or .003 per cent.

The average monthly balance for the fiscal year 1934-35 was $2,095,378.00; for the fiscal year 1935-36, it was $2,255,195.00, showing an increase in the present year over the previous year of $159,817.00, or 7.63 per cent.

A list of the approximate quantites of major commodities issued by the Stores during the year shows: 3,691 transformers, 3,651 poles, 6,510 electric meters, 4,611 water meters, 346 fire hydrants, 81,796 insulators, 17,582 cross arms; 159,400 feet copper service tubing, 488,667 feet lead covered cable, 17,000 cast-iron pipe fittings, 297,546 feet cast-iron and steel water pipe, 1,137,130 lbs. bare and weatherproof copper wire, 1,845,087 feet rubber-covered varnish cambric tree and telephone wire, 12,300,000 tabulating cards, 8,044,000 consumers' light and water bills, 7,161,500 post-cards and envelopes, 1,690,000 lbs. of perishable foods.

Salvage and Reclamation: As heretofore, the activities of the salvage and reclamation branch of the Stores Section are concerned with all materials returned to Stores which are not of 100 per cent value, which material is turned over to this section for disposal, and as in the past, this section endeavors to put as much as possible of this material to other uses in the Department before offering it for sale.

The total value of receipts in the Salvage Account for the year was $57,999.00; of issues $63,927.00. The issues exceeded receipts by $5,928.00. The average monthly balance was $48,334.00, reflecting a decrease of $24,758.00 in monthly balances over the previous year.

In addition to handling salvage this branch also handled the receiving, storing, and loading of all cast-iron pipe and fittings and miscellaneous yard materials, which for the year aggregated 3,506 tons of cast-iron and steel pipes, 700 tons of cast-iron fittings, and 1,331 tons of miscellaneous loads of lumber, rock, sand, gravel, and iron. Also, 10,798 feet of pipe were checked at trenchside delivery. The average daily tonnage handled approximated 23 tons.

The Printing Section, in addition to a volume of miscellaneous work, completed 2,147 jobs, producing 14,923,574 impressions or 19,671,710 copies of printed forms. The major portion of the printing done by this section was of consumers' light and water bills.

Right of Way and Land Division

CLARENCE S. HILL, *Right of Way and Land Agent*

THE following is a report of of the work accomplished by the Right of Way and Land Division during the fiscal year ending June 30, 1936.

BOULDER CANYON POWER TRANSMISSION LINE SAN BERNARDINO COUNTY

The right of way for that portion of Boulder Canyon Transmission Line in San Bernardino County lying between the California-Nevada State Line and Los Angeles-San Bernardino County Line, has either been purchased or options to purchase have been obtained, with the exception of 4 parcels which are included in a condemnation action filed in the Superior Court of San Bernardino County. An order for possession on these parcels was previously granted by the court, pending negotiations for settlement with the owners.

The following tabulation shows the status of Boulder Canyon Power Transmission Line right of way acquisition in San Bernardino County as of June 30, 1936:

	No. of Parcels	Acres	Line Miles	Total Cost	Percentage of Private Lands Acquired or Optioned
Easements acquired prior to June 30, 1935	197	3,119.59	54.262	$45,013.41	87.06%
Easements acquired during past fiscal year	11	230.37	4.952	11,271.95	7.94%
Options pending	5	70.33	1.562	2,944.00	2.51%
TOTALS	213	3,420.29	60.776	$59,229.36	97.51%

The percentages shown in the foregoing table are based upon the calculated distance of 62.328 line miles of privately owned property within the San Bernardino County area traversed by the transmission line.

TRANSMISSION LINE ROAD EASEMENTS

Although the transmission line easement provides for roads, it was found necessary, due to the topography of some of the lands over which the line passes, to obtain additional easements for road purposes. The following tabulation indicates easements or options obtained for this purpose in the San Bernardino County area:

	No. of Parcels	Acres	Line Miles	Total Cost
Easements acquired prior to June 30, 1935	8	7.59	1.262	$2,183.50
Easements acquired during past fiscal year	1	0.02	0.013	100.00
Options pending	1	5.70	1.240	1,200.00
TOTALS	10	13.31	2.515	$3,483.50

The Department was made defendant in an action filed by the owner of property in San Bernardino County, over which Boulder Canyon Transmission Line passes, which action was entitled "Gray vs. City of Los Angeles, et al," Superior Court Case No. 38602, San Bernardino County. This Division furnished all necessary title searches and appraisals and assisted the Legal Division by furnishing necessary data and testimony.

BOULDER CANYON POWER TRANSMISSION LINE LOS ANGELES COUNTY

The purchase of the transmission line right of way in Los Angeles County was somewhat delayed in the early part of the fiscal year, due to litigation and opposition directed against the Department by residents and property owners of the foothill district through which the line passes. Most of these obstacles have been eliminated and many of the property owners since, have either sold or granted options for easements over their prop-

erties to the Department. The remainder of the properties involved are covered by court orders giving the Department immediate possession of the required right of way pending the completion of negotiations or if necessary by court trial.

The following tabulation indicates privately owned properties within the Los Angeles County Area over which easements or options have been secured for Boulder Canyon Power Transmission Line Right of Way as of June 30, 1936.

	No. of Parcels	Acres	Line Miles	Total Cost	Percentage of Private Lands Acquired or Optioned
Easements acquired prior to June 30, 1935	7	11.03	0.762	$ 4,255.00	2.24%
Easements acquired during past fiscal year	73	145.10	10.117	104,203.50	29.76%
Easements—Options pending	33	98.12	6.941	103,323.00	20.41%
Fee purchased	3	1.42	0.136	5,400.00	0.40%
Fee optioned	3	2.84	1.130	12,025.00	0.38%
TOTAL	119	258.51	18.086	$229,206.50	53.19%

The Boulder Canyon Transmission Line will traverse approximately 34 miles of privately owned properties within Los Angeles County. The above percentages were computed on the basis of this figure.

TRANSMISSION LINE ROAD EASEMENTS

The following tabulation indicates easements obtained for road purposes from private property owners within the Los Angeles County Area.

No. of Parcels	Acres	Line Miles	Total Cost
12	21.13	4.044	$2,071.90

Appraisal work was completed in three condemnation actions filed in the Superior Court of Los Angeles County, one of which was entitled, "City of Los Angeles, et al vs. Musso, et al" and two entitled, "City of Los Angeles, et al vs. Kruse, et al." A total of 95 separate parcels, in various localities along the Transmission Line, were covered by these cases, one of which has been brought to trial.

LOS ANGELES LOOP POWER TRANSMISSION LINE

The following tabulation indicates privately owned properties in the Los Angeles County Area of which the fee title was purchased to complete the required right of way of the Los Angeles Loop Power Transmission Line.

No. of Parcels	Acres	Total Cost
7	1.06	$2,991.76

POWER RECEIVING STATION "E" SITE
LOS ANGELES COUNTY

The following tabulation indicates privately owned properties within the Los Angeles County Area which have been purchased as a site for Receiving Station "E".

	No. of Parcels	No. of Lots	Total Cost
Purchased prior to June 30, 1935	1	17½	$ 8,400.00
Purchased during past fiscal year	29	58½	23,775.00
TOTALS	30	76	$32,175.00

OTHER PROPERTIES ACQUIRED DURING FISCAL YEAR
LOS ANGELES COUNTY

For Water Bureau	Purchase Price
An easement for water tunnel purposes to be used in connection with Upper Hollywood Reservoir	$ 500.00
A parcel of land together with easements and right of way for road purposes to be used in connection with the caretaker's dwelling at the Aqueduct Cascades	1,000.00

(Continued on page 128)

An exchange of properties in the vicinity of Riverside Drive between Glendale Boulevard and Fletcher Drive was made, whereby the Department secured valuable frontage along Riverside Drive	Exchange
A parcel of land for a tank site in the vicinity of Topango Canyon	Gratis
A parcel of land for a tank site in the vicinity of Arroyo Seco Park to be known as the Lomitas Tank	Gratis
Two options for the purchase of easements over private property in the vicinity of Jefferson Boulevard and Sawtelle Boulevard for a 36 inch water main, total consideration to be paid	810.00

For Power Bureau

A lot on Mirimonte Boulevard was purchased as an addition to the property on which Overhead District No. 4 headquarters is located	2,500.00
A parcel of land fronting on Imperial Highway near Inglewood-Redondo Boulevard was purchased for a distributing station site, such station to supply to the Los Angeles Municipal Airport and the Hyperion Sewer Plant	2,000.00
An option was obtained on a lot on the north side of Brand Boulevard between Pico Street and Celis Street, in the town of San Fernando, on which it is planned to erect a Commercial Office to serve that District	2,000.00

LAND AND/OR WATER RIGHTS PURCHASED IN THE OWENS RIVER DRAINAGE AREA

RANCH PROPERTIES

The following tabulation shows the purchases of ranch properties and water rights in the Owens River Watershed as of June 30, 1936:

	No. of Owners	Acres	Purchase Price
Owned by City June 30, 1935	1,174	280,841	*$23,719,954.00
Acquired July 1, 1935, to June 30, 1936	2	80	2,350.00
In Escrow June 30, 1936	1	80	6,860.00
TOTALS	1,177	281,001	$23,729,164.00

* This figure includes cost of power plants in Owens River Gorge taken over in connection with the acquisition of the Southern Sierras Power Company and Associated Companies.

TOWN PROPERTIES

The following tabulation shows the purchases of properties and water rights in the Owens Valley towns of Laws, Bishop, Big Pine, Independence and Lone Pine under the program inaugurated in 1929 by the Board of Water and Power Commissioners:

	No. of Owners	No. of Parcels	Purchase Price
Owned by City June 30, 1935	697	1,247	$5,177,226.00
Acquired July 1, 1935, to June 30, 1936	2	2	16,501.50
In Escrow June 30, 1936	2	3	46,544.00**
Tentative options, "Bishop Pool"	17	33	275,543.55
TOTALS	718	1,285	$5,515,815.05

** Includes $43,116.00 representing 75% value of water rights agreements under option.

Commitments outstanding June 30, 1936 on 75% value on water rights agreements	$ 86,920.00
The Department purchased the equipment of the Richfield Oil Company at Lone Pine for a total consideration of	$ 4,265.00

Easements for highway purposes were granted to the Division of Highways of the State of California on Route IX from Bishop to Round Valley and from Big Pine to Keough's Hot Springs, and on Route IX-76A from Bishop via Laws to Inyo-Mono County Line.

Two parcels were sold to the United States Department of Agriculture, Forest Service; one parcel being in the Town of Lone Pine and the other near the City of Bishop. All water rights were reserved and retained by the City of Los Angeles.

MONO BASIN PROJECT

The following is a summary of lands and water rights acquired in the Mono Basin Drainage Area.

	No. of Owners	No. of Parcels	Purchase Price
Owned by City June 30, 1935	38	20,915	$4,656,449.00
Acquired July 1, 1935 to June 30, 1936	3	1,000	170,500.00
In escrow June 30, 1936	0	0	0.00
TOTALS	41	21,915	$4,826,949.00

An action entitled, "The City of Los Angeles, et al, vs. Arcularius, et al" was filed by the Department in Mono County, California, for the purposes of condemning a right of way for a portion of the Mono Craters Tunnel. Assistance was rendered the Legal Division by furnishing title searches, appraisals and other data required for the testimony to be presented.

INSURANCE

During the year the Right of Way and Land Division arranged for and negotiated the following insurance coverage for the Department.

One policy for public liability and property damage covering the clearing of Boulder Canyon Transmission Line Right of Way.

One policy for burglary, fire and sprinkler leakage covering stock and equipment in connection with the frequency change, at 2100 South Figueroa Street, Los Angeles.

Change in rider covering insurance on school bus used at Mono Basin.

TAXES

The Right of Way and Land Division handled all tax matters pertaining to Department owned properties in Los Angeles, Inyo, Mono, Kern, San Bernardino and Riverside Counties, California and Clark County, Nevada.

In the matter of taxes in the State of Nevada relative to Clark County, adjustments were made which were satisfactory to the State of Nevada, Clark County and the Department.

Protests to the Board of Supervisors of Inyo County and to the State Board of Equalization were filed in an endeavor to secure a reduction in valuation of Department properties for taxation purposes. In this connection it was necessary to make an appraisal and classification of all properties outside the towns owned by the Department in Inyo County.

RENTALS AND LEASES

INYO AND MONO COUNTIES

	Ranch Properties	Town Properties	Total
Leases in effect as of July 1, 1935	111	40	151
New leases made July 1, 1935 to June 30, 1936	91	21	112
	202	61	263
Leases terminated July 1, 1935 to June 30, 1936	90	24	114
Leases in effect as of June 30, 1936	112	37	149
Rental Agreements in effect July 1, 1935	101	561	662
New rental agreements made July 1, 1935 to June 30, 1936	53	310	363
	154	871	1,025
Rental Agreements terminated July 1, 1935 to June 30, 1936	36	283	319
Rental Agreements in effect as of June 30, 1936	118	588	706
Total leases and rental agreements in effect as of June 30, 1936	-----	-----	855

LOS ANGELES COUNTY

The Department owns and rents 199 improved properties along the Loop Power Transmission Line Right of Way. Approximately 50 other non-operative income acreage and business properties owned by the Department are rented or leased by this Division.

An oil well was brought into production on Department owned property in the Playa del Rey District of City on December 15, 1935, from which the Department receives a royalty of approximately $900.00 per month.

ACCIDENT INVESTIGATIONS

During the past fiscal year the Accident Investigation Section opened 1,461 files and closed 1,330 files.

There were 235 bills and claims filed against the Department amounting to $407,927.00 in which settlements and adjustments were made for approximately $18,834.00.

One hundred cases were filed in Small Claims Court, of which 48 cases were heard and judgment rendered in favor of the Department, 45 cases were dismissed, 5 cases were lost and 2 cases are pending.

Two cases were filed against the Department and judgment rendered in favor of the Department in one case and one-half of the judgment rendered against the Department in the other case.

In conjunction with the above this office collected and transmitted to the Accounting Division approximately $7,522.00 representing damages to City property by outsiders.

Accident Prevention

WALTER L. SMITH, *Safety Engineer*

THE fiscal year 1935-36 was an outstanding one for the two Bureaus of the Department of Water and Power in the matter of increase in volume of employment. This was caused partly by the program for the change in frequency from 50 to 60 cycles in the system of the Bureau of Power and Light; partly by the heavy work in progress on Boulder Power Transmission Line, which is nearing completion, and to a considerable extent by the work which is being carried on by the Bureau of Water Works and Supply in Mono Basin.

The accompanying chart indicates the trend of accidental injury frequency and severity rates of the Department for the fiscal year 1935-36, as compared with those for the five preceding fiscal years.

The records show an increase of 34.5% each in the total of man-hours of labor and the total amount of pay rolls for the year as compared with the average for the four previous fiscal years.

This increase in man-hours represents added exposure of the Department personnel to accident hazards because of the frequent labor turnover occasioned by the 90-day rotated plan of employment which the Department has adopted in its project work as an aid to unemployment relief.

The several Division Heads of the Department have shown excellent response in cooperating with the Accident Prevention Division in the matter of carrying out the Safety and First Aid training program, as a definite supervisory function and responsibility. This response, together with the resultant carrying out of Safe Practice procedure in all phases of the work has been effective in maintaining the comparatively low frequency and severity rate of the Department for the past three years.

The records show in regard to this, that there were 17.82 lost time injuries per million man-hours of labor and 2.04 days lost for each 1,000 hours worked for the fiscal year 1935-36, as compared with the averages for the last four previous fiscal years of 18.16 and 2.13 respectively. Another evidence of a decrease in the severity of accidents occurring during the past fiscal year is shown in a reduction of the average cost of accidents per $100.00 of pay roll for the above stated periods of from $1.20 to $0.75, which is equivalent to a 37.5 per cent decrease.

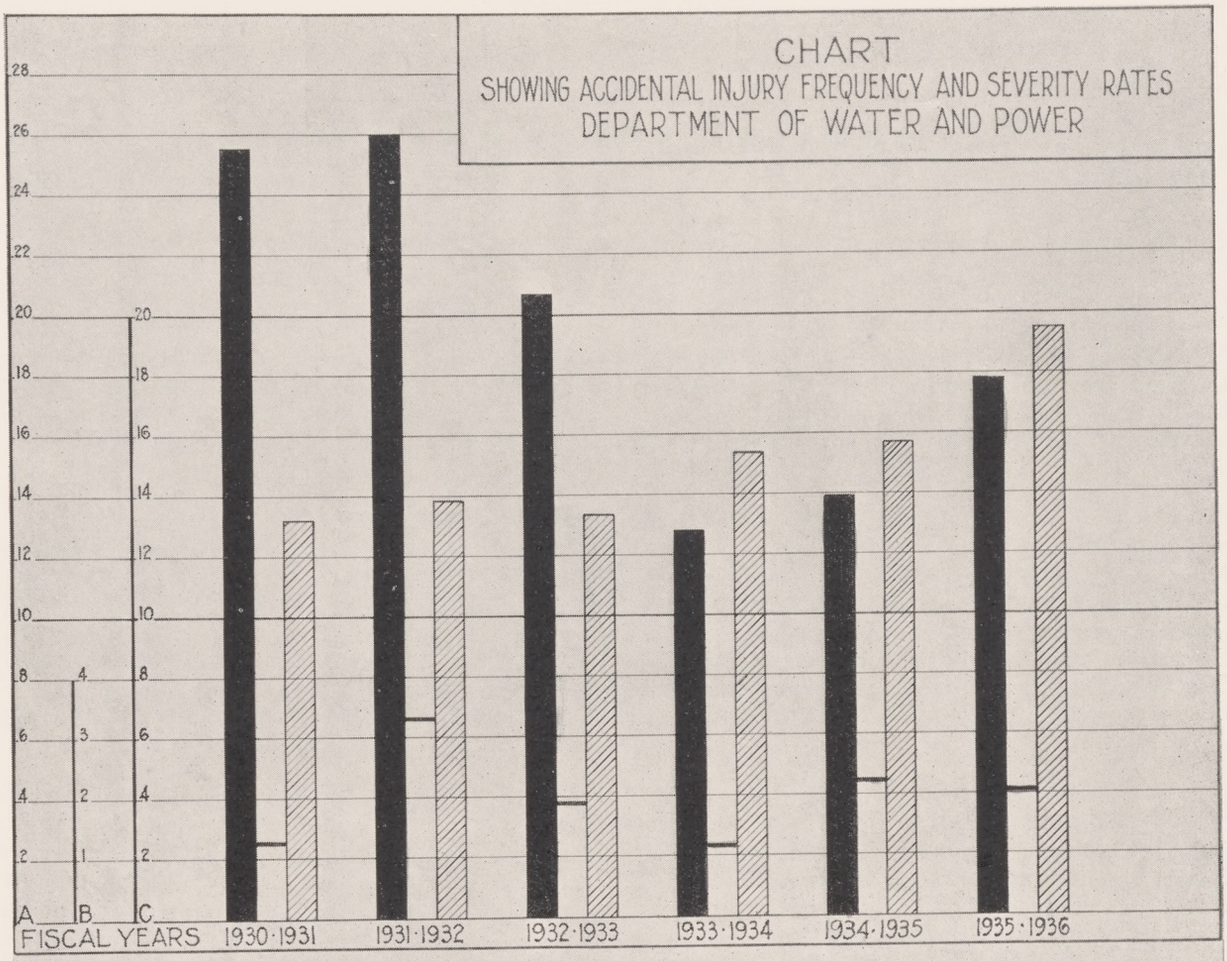
The Department's frequency and severity rates of 17.82 and 2.04 also show favorable comparison with the respective rates of 14.02 and 1.58 for other industrial organizations over the United States, reporting to the National Safety Council for the calendar year 1935.

The fiscal year record shows that accidents causing damage to the Department's automotive equipment, but having no relation to personal injury, increased slightly.

The record shows 40 accidents for each million car miles driven, or six above that of the previous year and four below the average for the past five previous fiscal years.

Investigation into the accident cost rate of $287.00 per million miles traveled for the past fiscal year, as compared with $262.00 for the previous year, reveals that damages are minor in character and are due chiefly to operators failing to accurately judge their clearances when parking the new streamline type of car.

The Accident Prevention Division has continued to cooperate during the year with all outside agencies in the interest, not only of the Department's safety, but also that of the public as well.



A - Refers To Solid Lines - Is Injury Frequency Rate Or Number Of Lost Time Injuries Per Million Man Hours Of Exposure.
B - Refers To Hollow Lines - Is Injury Severity Rate Or Number Of Days Lost On Account Of Injuries Per Thousand Hours Worked By All Employees Of Department Of Water And Power. Note: 6000 Days Charged Against Each Fatality.
C - Refers To Cross Sectioned Lines - Is Number Of Millions Of Man Hours Of Exposure.

Report of the Controller

HONORABLE BOARD OF WATER AND POWER COMMISSIONERS OF THE CITY OF LOS ANGELES,

GENTLEMEN:

I beg to submit herewith a report of the financial operations of the Department of Water and Power for the fiscal year ending June 30, 1936. The report consists of two parts, covering the operations of the Bureau of Water Works and Supply, and the Bureau of Power and Light, respectively. Exhibits accompany and immediately follow the text of the report on each Bureau, as follows:

BUREAU OF WATER WORKS AND SUPPLY

Title	*Exhibit*
Balance sheet as of June 30, 1936	I
Income account for the year ending June 30, 1936	II
Statement of Water Works bonds	III
Summary of resources available and disposition thereof	IV
Statement of assets and liabilities—Improvement Districts	V
Statement of Improvement District bonds	VI

BUREAU OF POWER AND LIGHT

Title	*Exhibit*
Balance sheet as of June 30, 1936	I
Income account for the year ending June 30, 1936	II
Statement of Electric Plant bonds	III
Summary of resources available and disposition thereof	IV
Statement of earnings, expenses, etc., from commencement of operations	V

BUREAU OF WATER WORKS AND SUPPLY

RESOURCES AVAILABLE AND DISPOSITION THEREOF

A summary of the resources available and the disposition thereof, as disclosed by a comparison of the balance sheets at the beginning and end of the year, is given in Exhibit IV. In condensed form the summary may be stated thus:

Resources available:	
Funds derived from operations	$ 4,051,000.00
Funds derived from sale of bonds	6,000,000.00
From City appropriations, tax allocations, and donations	924,000.00
Decrease in working capital	386,000.00
Miscellaneous sources	241,000.00
	$11,602,000.00
Disposition thereof:	
Expended in plant	$ 6,699,000.00
Redemption of bonds	2,719,000.00
Payments to General Fund of City	1,360,000.00
Increase in construction funds	824,000.00
	$11,602,000.00

All items are explained in detail in the text following.

INCOME ACCOUNT

The details of the income and expenses for the year are shown in Exhibit II.

Operating Revenues:

The following table sets forth a comparison of the operating revenues for the two years ending June 30, 1936:

	Year Ending		Increase
Water sales:	June 30, 1935	June 30, 1936	(Decrease)
Residential	$4,466,649.13	$4,754,914.09	$288,264.96
Commercial	2,619,014.67	2,818,990.53	199,975.86
Industrial	157,242.93	153,599.43	(3,643.50)
Irrigation	522,598.29	688,567.47	165,969.18
Governmental	1,099,461.23	1,125,058.39	25,597.16
Light and power—Owens Valley	205,836.51	168,762.78	(37,073.73)
Miscellaneous	42,485.50	27,584.75	(14,900.75)
	$9,113,288.26	$9,737,477.44	$624,189.18

The operating revenues for the fiscal period 1935-36 approximate those of 1931-32, and the increase over 1934-35 reflects a normal growth in water sales. The revenues from the sale of light and power in Owens Valley for the period 1935-36 were normal, those for the previous period having been increased through the use of energy for pumping made necessary by new storage facilities at Bouquet Canyon.

Operating Expenses:

Following is a comparison of operating expenses by classes for the same years:

	Year Ending		Increase
	June 30, 1935	June 30, 1936	(Decrease)
Source of water supply	$ 393,643.26	$ 305,451.86	($ 88,191.40)
Pumping	454,165.91	333,077.90	(121,088.01)
Purification	144,834.91	108,760.65	(36,074.26)
Distribution	1,089,297.49	1,177,584.02	88,286.53
Light and power—Owens Valley	120,754.04	80,767.77	(39,986.27)
Commercial	517,874.97	536,533.04	18,658.07
Taxes on property outside the City	187,494.39	227,551.63	40,057.24
General	674,462.87	660,243.30	(14,219.57)
	$3,582,527.84	$3,429,970.17	($152,557.67)

Decreases in operating expenses were the general rule for all activities. Important increases occurred only in distribution activities and in taxes paid. The increase in distribution expenses was caused principally by extraordinary work during the year in connection with corrosion protection on the San Fernando Valley trunk lines. The increase in taxes paid was mainly due to an increase in Inyo County assessment valuations.

Nonoperating Revenues:

During the year earnings from other than water operations were as follows:

Interest received and accrued on:		
Balances in special bond interest and sinking fund	$ 16,012.35	
Receivable from the Metropolitan Water District of Southern California	103,903.76	
Receivables from the Bureau of Power and Light	83,448.34	
Miscellaneous receivables	3,003.29	$206,367.74
Rents from properties not used in water operations (mostly in Owens Valley)	$369,618.78	
Less: Expenses incident to rental properties	135,478.45	234,140.33
Other nonoperating income		6,024.42
As Per Exhibit II		$446,532.49

Interest Paid and Accrued on Long-term Debt:

Interest paid and accrued on general bonds, $2,456,335.05, and on funding bonds, $189,702.56, are detailed in the Income Account.

Reserve for Unsettled Claim:

The amount of $75,000.00 under this caption represents provision for an unsettled claim of Inyo Chemical Company in respect of damages to its plant and mineral deposit by flood waters in 1927. Judgment was awarded to the claimant of a sum certain of $44,849.02 (against which the Bureau has as offset a judgment of $18,571.40 for power services) plus the present value of $182,700.00 in respect of the mineral deposit destroyed. Final settlement of the claim awaits an agreement between the litigants as to the calculation of the present value of the mineral deposit.

Provision for Depreciation of Plant and Equipment:

Details in connection with provision of $2,149,957.00 are given under balance sheet caption, "Plant and Equipment," hereafter.

BALANCE SHEET
PLANT AND EQUIPMENT ACCOUNTS

General Statement:

The net additions to the property accounts during the year amounted to $6,329,508.96, which, together with the balances, are summarized as follows:

	Balances June 30, 1935	Net Additions (Reductions)	Balances June 30, 1936
Lands and water rights	$ 36,769,310.59	$ 136,654.88	$ 36,905,965.47
Source of water supply system	33,831,087.50	143,872.27	33,974,959.77
Pumping system	2,555,111.33	(41,823.74)	2,513,287.59
Purification system	448,576.05	(34,121.12)	414,454.93
Distribution system	58,318,461.55	1,442,635.92	59,761,097.47
General structures and equipment	4,201,417.16	65,336.58	4,266,753.74
Owens Valley light and power system	2,009,583.12	3,696.68	2,013,279.80
Uncompleted construction	4,046,798.80	4,613,257.49	8,660,056.29
	$142,180,346.10	$6,329,508.96	$148,509,855.06

Additions in plant and equipment were made from funds as follows:		
Water Revenue Fund		$1,718,248.31
Water Works Bond Election 1930 Fund		4,923,420.79
Municipal Improvement District Bond Funds:		
District No. 35—Girard	$28,467.12	
District No. 36—Laurel Canyon	26,077.62	
District No. 52—Harbor City	2,773.36	57,318.10
		$6,698,987.20
Property accounts were reduced:		
By direct deductions from capital accounts with corresponding charges to depreciation reserve		369,478.24
Net additions as above		$6,329,508.96

Lands and Water Rights:

In the summary above lands and water rights are shown in the aggregate of the sums invested in such properties. This investment, segregated to facilities benefiting through their use, is shown in the following table:

	Balances June 30, 1935	Net Additions (Reductions)	Balances June 30, 1936
Source of water supply	$34,223,420.12	$268,576.54	$34,491,996.66
Pumping	33,939.47	(918.82)	33,020.65
Purification	200.00		200.00
Distribution	1,400,064.87	(1,993.00)	1,398,071.87
General	1,111,686.13	(129,009.84)	982,676.29
	$36,769,310.59	$136,654.88	$36,905,965.47

This does not include $4,359.00 for lands which are incorporated in the accounts under Owens Valley light and power system, in which no change occurred during the year.

The net changes in land accounts during the year are accounted for as follows:

	Additions	Reductions	Reclassifications	Net Change
Sources of water supply	$322,005.97	$ 53,429.43	$	$268,576.54
Pumping			(918.82)	(918.82)
Distribution	977.96		(2,970.96)	(1,993.00)
General	1,798.00	134,697.62	3,889.78	(129,009.84)
	$324,781.93	$188,127.05	$	$136,654.88

The principal additions to land accounts were for land and water rights in connection with water development in Mono Basin.

The reductions are accounted for as follows:

Sources of Water Supply:

Lands sold:		
Los Angeles area	$ 1,000.00	
Owens Valley area	24,000.00	$ 25,000.00
Legal expenses (Aitken condemnation case) transferred to uncompleted construction		23,309.22
Miscellaneous—mostly salvage recoveries from Owens Valley ranches		5,120.21
		$ 53,429.43

General:

Value of submerged land at Boulder Canyon, transferred to United States Government	$ 20,136.80
Value of structures and improvements to grounds at Ducommun Street, transferred to general structure account	114,480.82
Miscellaneous	80.00
	$134,697.62
As above	$188,127.05

The reclassifications were for minor parcels of land no longer used or useful to the facilities carrying the investment, transferred to general lands.

Source of Water Supply System:

During the year the "Y" branch connection between the Bouquet Canyon pipe line and Fairmont penstock was completed. As in the case of the reservoir and pipe line, this installation is equally beneficial to each of the Bureaus of the Department. The costs, included in production plant in Power Bureau accounts were $126,127.24, of which $67,263.05 was allocated to the Water Bureau and charged to source of water supply plant.

The computation used for the allocation was as follows:

Construction costs, Power Bureau		$126,127.24
Interest during construction (for computation purposes only)		8,159.53
		$134,286.77
Less: Construction costs, Water Bureau		383.94
		$133,902.83
Allocated to Power Bureau	$66,951.42	
Less: Adjustment of previous year's allocation	311.64	$ 66,639.78
Allocated to Water Bureau	$66,951.41	
Add: Adjustment of previous year's allocation	311.64	67,263.05
As above		$133,902.83

The hydrographic equipment of the Bureau, valued at $70,860.27, formerly carried in general plant, was transferred during the year to source of water supply plant as the result of an inventory of such equipment.

Pumping and Purification Systems:

The reduction in value of these systems was principally occasioned by adjustments necessary to bring the plant valuations in accord with physical inventories taken during the year.

Distribution System:

The net additions to the distribution system, by items, were as follows:

Structures	$ 99,162.19
Reservoirs and tanks	62,507.36
Mains	932,234.25
Fire hydrants	13,111.06
Services	256,279.79
Meters	70,814.68
Miscellaneous	8,526.59
Net additions	$1,442,635.92

The net additions to distribution mains resulted chiefly from the installation of approximately twelve miles of thirty-two inch main from 98th Street in Los Angeles to the Harbor District. Other increases in investment reflect normal growth of the plant.

General Structures and Equipment:

The net addition to general structures and equipment was as follows:

Structures		$145,510.02
General office equipment		17,813.88
General laboratory equipment		15,172.86
		$178,496.76
Less: Investment in		
Joint facility plant	$22,827.56	
Miscellaneous general equipment	90,332.62	113,160.18
Net addition		$ 65,336.58

The addition to structure investment included $114,480.82 transferred from land accounts as noted above. Additions to general office equipment consisted of $4,326.29 net increase in Water Bureau general office, and $13,487.59 in Joint Divisions' general office investment. Decrease in miscellaneous general equipment includes $70,860.27, value of hydrographic equipment transferred to source of water supply equipment accounts.

Owens Valley Light and Power System:

There was little activity in Owens Valley plant accounts during the year, the net increase being $3,696.68.

Uncompleted Construction:

Uncompleted construction at June 30, 1935, at June 30, 1936, and the changes therein are summarized as follows:

	June 30, 1935	June 30, 1936	Increase
Mono Craters Tunnel	$3,709,833.92	$6,828,957.45	$3,119,123.53
Long Valley Dam	204,689.79	1,039,165.15	834,475.36
Grant Lake Dam	90,348.24	738,442.42	648,094.18
Miscellaneous	41,926.85	53,491.27	11,564.42
	$4,046,798.80	$8,660,056.29	$4,613,257.49

During the year there was expended on construction work in Mono Basin water development projects $4,129,114.78, and interest during construction in connection with such projects was capitalized in the amount of $472,578.29. The miscellaneous items of construction were for other than Mono Basin enterprises.

Reserve for Depreciation:

Provision for depreciation of plant and equipment has been made on the straight-line method as in prior years. The changes in the reserve during the year are summarized as follows:

Balance June 30, 1935		$22,689,961.40
Add: Provision for year ending June 30, 1936		
Charged to profit and loss (Exhibit II)	$2,149,957.00	
Charged to clearing accounts	4,501.00	
Charged to Power Revenue Fund in respect of joint facilities clearing accounts	24,582.00	2,179,040.00
		$24,869,001.40
Deduct: Charges for replacements, etc.		
Source of water supply system	$ 8,390.23	
Pumping system	28,048.31	
Purification system	19,806.93	
Distribution system	247,218.25	
General structures and equipment	61,048.39	
Owens Valley light and power system	4,966.13	369,478.24
Balance June 30, 1936 (Exhibit I)		$24,499,523.16

OTHER ASSET ACCOUNTS

Construction Fund:

The only active construction fund was that of the Water Works Bond Election 1930 Fund, in which moneys unexpended at June 30, 1936 amounted to $1,718,761.55. Of this amount there was due the Revenue Fund for services performed $43,235.06, leaving a balance of $1,675,526.49 available for payment of its other liabilities and for future construction. Of this issue, $2,200,000.00 remained to be sold at the date of the balance sheet.

The status of the fund now and to be available through the sale of remaining bonds is as follows:

Cash on hand June 30, 1936		$1,718,761.55
Bonds not sold		2,200,000.00
		$3,918,761.55
Less: Liabilities		
Due Water Revenue Fund	$ 43,235.06	
Due Power Revenue Fund	56,845.12	
Others	257,294.24	357,374.42
		$3,561,387.13

Metropolitan Water District of Southern California—Long-term Receivables:

At June 30, 1935, the obligation of the Metropolitan Water District to the Bureau for services rendered or assets furnished in connection with the Colorado River Aqueduct was $2,467,811.74. Interest accrued during the year was $103,903.76; collections in respect of principal and interest were $120,373.65; the balance due at June 30, 1936 was $2,451,341.85, as per the balance sheet.

Bureau of Power and Light—Long-term Receivable:

The changes in this receivable during the year were as follows:		
Receivable at June 30, 1935		$1,892,520.81
Less: Liquidations		
In cash	$ 78,855.02	
By allocation of construction expenditures	67,263.05	146,118.07
Receivable at June 30, 1936		$1,746,402.74

Particulars of the "allocated construction expenditures" are given under Plant and Equipment caption, "Source of Water Supply System," above.

Bond Interest and Sinking Funds:

The changes during the year in the Water Works Bond Interest and Sinking Funds are summarized as follows:

	General Water Works Bonds	Funding Bonds
Balances June 30, 1935	$3,547,184.99	$ 15,574.70
Add: Receipts for year:		
From Water Revenue Fund	$5,316,200.00	
Allocated from local taxes		$ 1,557.44
Accrued interest at sale of bonds	13,546.88	
Premium received at sale of bonds	351.00	
Transferred from Reserve Fund of City		493,994.88
Interest earned and received on fund balances	16,012.35	
	$5,346,110.23	$ 495,552.32
	$8,893,295.22	$ 511,127.02
Deduct:		
Bonds redeemed	$2,423,400.00	$ 300,000.00
Interest coupons paid	2,897,398.25	194,138.04
	$5,320,798.25	$ 494,138.04
Balances June 30, 1936	$3,572,496.97	$ 16,988.98
Total as per balance sheet		$3,589,485.95

In accordance with action of your honorable body, there was paid during the year into the General Fund of the City $493,994.88, equal to the principal and interest requirements during the year on Santa Clara Valley Damage funding bonds. A like amount was thereupon transferred by the City from its Reserve Fund to the Bond Interest and Sinking Fund, as above shown.

Revenue Fund:

Cash on hand and deposited with the City Treasurer at June 30, 1936, amounted to $443,739.80. Cash deposited, $342,169.59, was reconciled with the City Treasurer's balance.

Water Construction Fund—Current Account:

This account represents the net amount available at June 30, 1936, in construction fund (as above) for reimbursement to the Revenue Fund for expenditures made by the Revenue Fund in behalf of such construction fund, and is transferred from "Construction Fund" to "Water Construction Fund — Current Account" for balance sheet purposes only.

Miscellaneous Accounts and Notes Receivable:

As shown by the balance sheet, the principal item is that of consumers' accounts receivable. Other accounts receivable amount to $128,301.15, and notes receivable, $26,841.55.

The notes receivable are segregated according to class of transaction from which each originated as follows:

Sales of land (Clifford F. Reid, Inc.)	$ 6,508.63
Rentals of Owens Valley properties	3,949.60
Rentals of Los Angeles properties	75.00
Irrigation water bills	4,318.65
Power bills (Sierra Salt Co.)	716.81
Installation of street mains	10,375.56
Miscellaneous	897.30
	$ 26,841.55

A reserve for possible loss on accounts and notes has been provided in the sum of $68,835.12, as shown by the balance sheet, which amount is considered adequate.

Revolving Funds:

Revolving Funds in the hands of Divisions and employees to be used as petty cash or working funds amounted to $28,950.00, as per the balance sheet.

Municipal Improvement Districts—Current Account:

The amount shown in the balance sheet, $55,729.62, represents construction work performed by the Water Revenue Fund for the benefit of the various Municipal Improvement Districts, unpaid at June 30, 1936.

Construction Materials and Supplies:

Physical inventories of materials and supplies on hand were taken at scheduled times throughout the year, and accounts adjusted accordingly. The amount stated in the balance sheet, $897,530.92, is segregated to funds as follows:

Water Revenue Fund	$ 882,909.43
Water Works Bond Election 1930 Fund	14,621.49
	$ 897,530.92

Deferred Charges:

The items comprising deferred charges at June 30, 1936, were as follows:

Preliminary survey and investigation charges in connection with Public Works Administration projects	$ 45,533.57
Preliminary expenditures regarding grant for such projects	21,161.59
Miscellaneous	2,726.30
	$ 69,421.46
Undistributed balances in clearing accounts	20,747.91
	$ 90,169.37

OTHER LIABILITY ACCOUNTS

Funded Debt:

Particulars of the several issues of bonds for water purposes are shown in Exhibit III. The changes during the year are summarized as follows:

	General	Funding
Outstanding June 30, 1935:		
Unmatured	$64,481,200.00	$4,314,349.59
Matured	23,000.00	10,000.00
	$64,504,200.00	$4,324,349.59
Sold during year:		
1930 issue	6,000,000.00	
	$70,504,200.00	$4,324,349.59
Redeemed during year	2,423,400.00	300,000.00
Outstanding June 30, 1936:		
Unmatured	$68,061,800.00	$4,014,349.59
Matured	19,000.00	10,000.00
	$68,080,800.00	$4,024,349.59

As hereinbefore mentioned, $2,200,000.00 of the 1930 bonds remain unsold.

An issue of Revenue Bonds, $3,000,000.00, was authorized in accordance with Section 224 of the City Charter on June 24, 1936, but had not been sold at the date of the balance sheet.

Accrued Interest:

Particulars in connection with interest payable and accrued on long-term debt are set forth in detail in the balance sheet, Exhibit I.

Land Purchase Obligations:

The amount of $56,838.00 represents liabilities at June 30, 1936 on account of land purchases, principally in Inyo and Mono Counties. These liabilities are segregated as to funds, as follows:

Water Revenue Fund	$ 800.00
Water Works Bond Election 1930 Fund	56,038.00
As per balance sheet	$56,838.00

Land Rentals Paid in Advance:

Under this caption is reported all unearned revenue at the date of the balance sheet in respect of land rentals held as deferred credits until such time as rentals become due and payable. These rentals are in connection with Owens Valley properties.

Bureau of Power and Light—Current Account:

The balance in this account, $271,281.33, represents the amount due the Bureau of Power and Light, principally for June, 1936, expenses of joint facility divisions of the Department, which, in the main, are paid in the first instance by the Power Bureau, subject to reimbursement for expenses applicable to the Water Bureau.

Reserve for Unsettled Claim:

The amount of $75,000.00 is a reservation provided for claim of the Inyo Chemical Company, as fully explained heretofore under the same caption in the Income Account.

Other Current Liabilities:

All other accounts payable of the Water System are reflected in the accompanying balance sheet under this caption, except that no provision is made therein for any liabilities of a contingent nature, including materials contracted for but not received at June 30, 1936, in the approximate amount of $196,000.00. Accrued pay rolls of $166,170.60 were for the fifteen days ending June 30, 1936.

Unamortized Premium:

The amount shown in the balance sheet, $154,497.97, is that portion of the premium received in connection with the sale of general and funding bonds applicable to future operations.

Improvement District Funds Invested in Water System:

Proceeds from sales of improvement district bonds for water purposes, although deposited in construction funds under the control of your honorable body, are not an obligation of the Bureau or of the City at large, but of the Districts authorizing the issue. The properties constructed from such funds, however, become an integral part of the water system. Details of the funds are appended as Exhibits V and VI.

There has been provided for construction purposes, through the sale of Improvement District bonds,

(See Exhibit VI)	$8,930,734.80	
and from premium on bonds, etc	76,073.00	$9,006,807.80
Of this amount there has been transferred into the bond interest and sinking funds of the districts from unexpended construction funds	$ 233,008.56	
and there is on hand an unencumbered cash balance of	199,944.57	432,953.13
leaving the gross investment from district funds		$8,573,854.67
There has been contributed by the Bureau in prior years for district bond service		64,105.30
Deducting this amount, the net investment of Improvement District funds in the Water System is		$8,509,749.37

Investment of the City of Los Angeles:

The investment of the City in its Water System, by items, as at June 30, 1935, and June 30, 1936, and the changes therein, were as follows:

	Balances June 30, 1935	Balances June 30, 1936	Increases (Decreases)
Investment from proceeds of taxation:			
Allocation from taxes for bond redemption and interest requirements:			
General water works bonds:			
Local taxes	$23,038,719.73	$23,038,719.73	$
State taxes	3,840,047.67	3,840,047.67	
City of Eagle Rock water works bonds	8,672.71	8,672.71	
Funding bonds (Santa Clara Valley damages)	1,261,556.24	1,263,113.68	1,557.44
	$28,148,996.35	$28,150,553.79	$ 1,557.44
Appropriations for special purposes:			
St. Francis dam disaster	$ 3,833,825.49	$ 4,327,820.37	$ 493,994.88
Sundry	32,787.09	32,787.09	
	$ 3,866,612.58	$ 4,360,607.46	$ 493,994.88
	$32,015,608.93	$32,511,161.25	$ 495,552.32
Deduct:			
Water furnished other departments not paid for	$ 9,743,974.66	$ 9,743,974.66	$
Payments to General Fund of City	2,511,276.98	3,871,271.86	1,359,994.88
	$12,255,251.64	$13,615,246.52	$ 1,359,994.88
	$19,760,357.29	$18,895,914.73	$ (864,442.56)
Donations in aid of construction:			
Street main assessments	$ 6,673,438.50	$ 6,779,098.82	$ 105,660.32
Service installations	4,628,913.34	4,732,867.29	103,953.95
Meter installations	492,947.63	499,167.23	6,219.60
Fire hydrant installations	994,496.27	1,011,903.94	17,407.67
Water systems donated (as appraised by department engineers)	1,683,857.87	1,699,798.24	15,940.37
Owens Valley light and power system	11,048.71	11,311.60	262.89
By State Emergency Relief Administration		45,495.69	45,495.69
By Works Progress Administration		6,958.46	6,958.46
	$14,484,702.32	$14,786,601.27	$ 301,898.95
Donations for maintenance	$	$ 126,320.70	$ 126,320.70
Earned surplus:			
Surplus arising from operations	$26,849,979.11	$28,733,024.26	$ 1,883,045.15
Deduct: Ascertained losses arising from St. Francis dam disaster:			
Property loss and expenditures by Water Revenue Fund	$ 1,629,941.12	$ 1,629,941.12	
Claims paid and expenditures by other City funds	8,134,068.69	8,134,068.69	
	$ 9,764,009.81	$ 9,764,009.81	
	$17,085,969.30	$18,969,014.45	$ 1,883,045.15

The reduction in investment from proceeds of taxation was due to the payment, other than that for principal and interest requirements on Santa Clara Valley damage funding bonds, and pursuant to provisions of Section 221 of the City Charter, of $866,000.00 into the General Fund of the City.

The donations for maintenance were in respect of labor donated by the State Emergency Relief Administration expended in maintaining the Water System.

The earned surplus increase of $1,883,045.15 represents the net income for the year under review, as per Exhibit II.

EXHIBIT I

DEPARTMENT OF WATER AND POWER
CITY OF LOS ANGELES
BUREAU OF WATER WORKS AND SUPPLY
BALANCE SHEET—JUNE 30, 1936

ASSETS

PLANT AND EQUIPMENT:		
Land and water rights	$36,905,965.47	
Source of water supply system	33,974,959.77	
Pumping system	2,513,287.59	
Purification system	414,454.93	
Distribution system	59,761,097.47	
General structures and equipment	4,266,753.74	
Owens Valley light and power system	2,013,279.80	
Uncompleted construction	8,660,056.29	$148,509,855.06
CONSTRUCTION FUND:		
Cash with City Treasurer	$ 1,718,761.55	
Less: Net amount available for reimbursement to Revenue Fund for construction expenditures (see below)	43,235.06	1,675,526.49
METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA — LONG-TERM RECEIVABLE: (Including accrued interest $118,882.43)		2,451,341.85
BUREAU OF POWER AND LIGHT—LONG-TERM RECEIVABLE		1,746,402.74
BOND INTEREST AND SINKING FUNDS:		
Cash with City Treasurer for payment of matured bonds and coupons	$ 65,802.04	
Future maturities	3,523,683.91	3,589,485.95
REVENUE FUND:		
Cash with City Treasurer	$ 342,169.59	
Cash on hand	101,570.21	443,739.80
WATER CONSTRUCTION FUND—Current Account (see above)		43,235.06
MISCELLANEOUS ACCOUNTS AND NOTES RECEIVABLE:		
Consumers' accounts	$ 733,969.99	
Other accounts and notes	155,142.70	
	$ 889,112.69	
Less: Reserve for doubtful accounts and notes	68,835.12	820,277.57
REVOLVING FUNDS		28,950.00
MUNICIPAL IMPROVEMENT DISTRICTS—Current Account		55,729.62
CONSTRUCTION MATERIALS AND SUPPLIES		897,530.92
DEFERRED CHARGES:		
Preliminary engineering	$ 69,421.46	
Miscellaneous	20,747.91	90,169.37
		$160,352,244.43

LIABILITIES

FUNDED DEBT:		
Bonds—general:		
Unmatured	$68,061,800.00	
Matured	19,000.00	
	$68,080,800.00	
Bonds—funding:		
Unmatured	$ 4,014,349.59	
Matured	10,000.00	
	$ 4,024,349.59	$ 72,105,149.59
ACCRUED INTEREST:		
Bonds—general:		
Matured coupons	$ 31,370.50	
Accrued but not due	787,678.63	
	$ 819,049.13	
Bonds—funding:		
Matured coupons	$ 5,431.54	
Accrued but not due	47,168.60	
	$ 52,600.14	871,649.27
LAND PURCHASE OBLIGATIONS		56,838.00
LAND RENTALS PAID IN ADVANCE		17,116.11
BUREAU OF POWER AND LIGHT—Current Account		271,281.33
RESERVE FOR UNSETTLED CLAIM		75,000.00
OTHER CURRENT LIABILITIES:		
Accounts payable for materials, etc.	$ 258,910.74	
Accrued pay rolls	166,170.60	
	$ 425,081.34	
Consumers' deposits	588,507.14	1,013,588.48
RESERVE FOR DEPRECIATION		24,499,523.16
UNAMORTIZED PREMIUM:		
Bonds—general	$ 138,165.04	
Bonds—funding	16,332.93	154,497.97
IMPROVEMENT DISTRICT FUNDS: INVESTED IN WATER SYSTEM		8,509,749.37
INVESTMENT OF THE CITY OF LOS ANGELES:		
Investment from proceeds of taxation	$18,895,914.73	
Donations in aid of construction	14,786,601.27	
Donations for maintenance	126,320.70	
Earned surplus	18,969,014.45	52,777,851.15
		$160,352,244.43

EXHIBIT II

DEPARTMENT OF WATER AND POWER
CITY OF LOS ANGELES
BUREAU OF WATER WORKS AND SUPPLY

INCOME ACCOUNT FOR THE YEAR ENDING JUNE 30, 1936

Gross operating revenue:			
Water Sales:			
Residential		$4,754,914.09	
Commercial		2,818,990.53	
Industrial		153,599.43	
Irrigation		688,567.47	
Governmental		1,125,058.39	
Light and Power—Owens Valley		168,762.78	
Miscellaneous		27,584.75	$9,737,477.44
Deduct: Operating Expenses:			
Source of water supply		$ 305,451.86	
Pumping		333,077.90	
Purification		108,760.65	
Distribution		1,177,584.02	
Light and Power—Owens Valley		80,767.77	
Commercial		536,533.04	
Taxes on property outside the City		227,551.63	
General		660,243.30	3,429,970.17
Net operating revenue			$6,307,507.27
Add: Nonoperating revenues:			
Interest		$ 206,367.74	
Other nonoperating revenues, net		240,164.75	446,532.49
Net income before interest, depreciation, etc.			$6,754,039.76
Deduct:			
Interest paid and accrued on general bonds		$2,937,637.83	
Less:			
Interest during construction capitalized	$472,578.29		
Amortization of bond premium	8,724.49	481,302.78	
		$2,456,335.05	
Reserve for unsettled claim		75,000.00	
Provision for depreciation of plant and equipment		2,149,957.00	4,681,292.05
Net income before deducting interest on funding bonds			$2,072,747.71
Deduct:			
Interest paid and accrued on funding bonds		$ 192,257.36	
Less: Amortization of bond premiums		2,554.80	189,702.56
Net income			$1,883,045.15

EXHIBIT III

DEPARTMENT OF WATER AND POWER
CITY OF LOS ANGELES
BUREAU OF WATER WORKS AND SUPPLY

STATEMENT OF WATER WORKS BONDS, JUNE 30, 1936

	Authorized	Date of Issue	Interest Rate %	Sold	Matured	Outstanding	Annual Maturities	
							Amount	Period
General Water Works:								
1901	$ 2,000,000.00	October 1, 1901	3¾	$ 2,000,000.00	$ 1,700,000.00	$ 300,000.00	$ 50,000.00	1936—1941
1904 Reservoir	150,000.00	June 1, 1904	3¾	150,000.00	120,000.00	30,000.00	3,750.00	1937—1944
1904	337,500.00	June 1, 1904	3¾	337,500.00	337,500.00	----------	----------	----------
1905	1,500,000.00	November 1, 1905	4	1,500,000.00	1,125,000.00	375,000.00	37,500.00	1936—1945
1907	23,000,000.00	December 1, 1907	4	1,033,600.00	668,800.00	364,800.00	30,400.00	1936—1947
		December 1, 1907	4½	21,964,000.00	14,212,000.00	7,752,000.00	646,000.00	1936—1947
1913	1,500,000.00	May 1, 1913	4½	1,500,000.00	900,000.00	600,000.00	50,000.00	1937—1948
1922	5,000,000.00	January 1, 1923	4¼	1,000,000.00	----------	1,000,000.00	50,000.00	1944—1963
		January 1, 1923	4½	3,000,000.00	1,300,000.00	1,700,000.00	100,000.00	1937—1943
							50,000.00	1944—1963
		February 1, 1923	5	1,000,000.00	325,000.00	675,000.00	25,000.00	1937—1963
1924	8,000,000.00	June 1, 1924	4¾	6,000,000.00	1,800,000.00	4,200,000.00	150,000.00	1937—1964
		June 1, 1924	4½	2,000,000.00	600,000.00	1,400,000.00	50,000.00	1937—1964
1925 Owens Valley	8,000,000.00	July 1, 1925	4½	3,000,000.00	750,000.00	2,250,000.00	75,000.00	1936—1965
		July 1, 1925	4¾	5,000,000.00	1,250,000.00	3,750,000.00	125,000.00	1936—1965
1925 Colorado River	2,000,000.00	December 1, 1925	4½	500,000.00	140,000.00	360,000.00	14,000.00	1936—1959
							12,000.00	1960—1961
		December 1, 1926	4½	500,000.00	126,000.00	374,000.00	14,000.00	1936—1961
							10,000.00	1962
		July 1, 1928	4½	500,000.00	98,000.00	402,000.00	14,000.00	1936—1963
							10,000.00	1964
		November 1, 1929	4¾	500,000.00	84,000.00	416,000.00	14,000.00	1936—1964
							10,000.00	1965
1926	10,000,000.00	November 1, 1926	4½	6,000,000.00	1,350,000.00	4,650,000.00	150,000.00	1936—1966
		November 1, 1926	4	1,000,000.00	225,000.00	775,000.00	25,000.00	1936—1966
		July 1, 1928	4½	500,000.00	98,000.00	402,000.00	14,000.00	1936—1963
							10,000.00	1964
		March 1, 1929	4¾	2,500,000.00	441,000.00	2,059,000.00	63,000.00	1937—1968
							43,000.00	1969
1930	38,800,000.00	October 1, 1930	4¼	5,000,000.00	625,000.00	4,375,000.00	125,000.00	1936—1970
		April 1, 1931	4	6,000,000.00	750,000.00	5,250,000.00	150,000.00	1937—1971
		October 1, 1931	5	1,600,000.00	160,000.00	1,440,000.00	40,000.00	1936—1971
		April 1, 1932	5	1,000,000.00	100,000.00	900,000.00	25,000.00	1937—1972
		September 1, 1932	5	1,400,000.00	105,000.00	1,295,000.00	35,000.00	1936—1972
		January 1, 1933	4¾	2,000,000.00	150,000.00	1,850,000.00	50,000.00	1937—1973
		July 1, 1933	5	1,000,000.00	1,000,000.00*			
		February 1, 1934	5	5,000,000.00	250,000.00	4,750,000.00	125,000.00	1937—1974
		June 1, 1934	4½	2,000,000.00	100,000.00	1,900,000.00	50,000.00	1937—1974
		November 1, 1934	4¼	2,000,000.00	50,000.00	1,950,000.00	50,000.00	1936—1974
		April 1, 1935	3¾	2,000,000.00	50,000.00	1,950,000.00	50,000.00	1937—1975
		June 1, 1935	3½	1,600,000.00	40,000.00	1,560,000.00	40,000.00	1937—1975
		September 1, 1935	4	1,200,000.00	----------	1,200,000.00	75,000.00	1936—1951
		September 1, 1935	3½	1,800,000.00	----------	1,800,000.00	75,000.00	1952—1975
		March 1, 1936	4	900,000.00	----------	900,000.00	75,000.00	1937—1948
		March 1, 1936	2¾	450,000.00	----------	450,000.00	75,000.00	1949—1954
		March 1, 1936	3	1,650,000.00	----------	1,650,000.00	75,000.00	1955—1976
Refunding (1935)	975,000.00	April 1, 1935	3½	975,000.00	25,000.00	950,000.00	25,000.00	1937—1974
	$ 101,262,500.00			$ 99,060,100.00	$31,055,300.00	$68,004,800.00		

EXHIBIT III—*Continued*

City of Eagle Rock Water Works:									
1916	$ 70,000.00	January	2, 1917	5	$ 70,000.00	$ 38,000.00	$ 32,000.00	$ 2,000.00	1937—1952
1921	40,000.00	April	1, 1921	6	40,000.00	15,000.00	25,000.00	1,000.00	1937—1961
	$ 110,000.00				$ 110,000.00	$ 53,000.00	$ 57,000.00		
Funding Bonds (Santa Clara Valley Damages):									
Series No. 1	$ 500,000.00	October	1, 1928	4¾	$ 500,000.00	$ 182,000.00	$ 318,000.00	$ 26,000.00	1936—1946
								16,000.00	1947—1948
Series No. 2	2,000,000.00	October	1, 1928	5	2,000,000.00	700,000.00	1,300,000.00	100,000.00	1936—1948
Series No. 3	1,500,000.00	October	1, 1928	4¾	1,500,000.00	525,000.00	975,000.00	75,000.00	1936—1948
Series No. 4	500,000.00	October	1, 1928	4¾	500,000.00	150,000.00	350,000.00	25,000.00	1936—1949
Series No. 5	556,310.00	October	1, 1929	4¼	556,310.00	168,000.00	388,310.00	28,000.00	1936—1948
								24,310.00	1949
Series No. 6	737,039.59	October	1, 1930	4¼	737,039.59	190,000.00	547,039.59	38,000.00	1936—1948
								26,500.00	1949
								26,539.59	1950
Series No. 7	122,483.00	October	1, 1930	4	122,483.00	30,483.00	92,000.00	6,000.00	1936—1948
								7,000.00	1949—1950
Series No. 8	52,323.48	April	1, 1932	5	52,323.48	8,323.48	44,000.00	2,000.00	1937
								3,000.00	1938—1951
	$ 5,968,156.07				$ 5,968,156.07	$ 1,953,806.48	$ 4,014,349.59		
	$ 107,340,656.07				$ 105,138,256.07	$33,062,106.48	$72,076,149.59		
Matured bonds not presented for payment at June 30, 1936:									
1924 General bonds						18,000.00			
1930 General bonds						1,000.00			
Funding bonds						10,000.00	29,000.00		
Total bonds outstanding June 30, 1936							$72,105,149.59		

* Including $975,000 retired by proceeds of refunding bonds issued in 1935.

EXHIBIT IV

DEPARTMENT OF WATER AND POWER
CITY OF LOS ANGELES
BUREAU OF WATER WORKS AND SUPPLY
YEAR ENDING JUNE 30, 1936

SUMMARY OF RESOURCES AVAILABLE AND DISPOSITION THEREOF

Resources Available:	
Net income for the year ending June 30, 1936	$ 1,883,045.15
Add: Provision for depreciation of plant and equipment	2,179,040.00
	$ 4,062,085.15
Deduct: Proportion of bond premium included in income	11,279.29
Funds derived from operations	$ 4,050,805.86
Proceeds from sale of general bonds, including $351.00 premium	6,000,351.00
Tax allocations and City appropriations in respect of funding bonds	495,552.32
Credited to Metropolitan Water District on long-term debt	16,469.89
Credited to Bureau of Power and Light on long-term debt	146,118.07
Received (or receivable) from improvement districts for construction of plant and equipment	57,318.10
Donations in aid of construction	301,898.95
Donations for maintenance	126,320.70
Decrease in working capital (per accompanying table)	386,480.49
Decrease in net assets of sinking funds (per accompanying table)	21,179.52
Total	$11,602,494.90
Accounted for as follows:	
Additions to plant and equipment (net)	$ 6,329,508.96
Expenditures for replacements, etc.	369,478.24
Bonds matured	2,719,400.00
Increase in construction funds with City Treasurer	824,112.82
Payments into General Fund of City	1,359,994.88
As above	$11,602,494.90

COMPARISON OF WORKING AND CURRENT ASSETS AND CORRESPONDING LIABILITIES

	June 30, 1935	June 30, 1936
Assets:		
Cash	$1,277,248.39	$ 443,739.80
Improvement districts—current account	2,361.57	55,729.62
Other accounts receivable	874,691.56	849,227.57
Materials and supplies	990,639.31	897,530.92
Deferred charges	46,155.65	90,169.37
	$3,191,096.48	$2,336,397.28
Liabilities:		
Bureau of Power and Light—current account	$ 467,242.75	$ 271,281.33
Other accounts payable	1,250,101.72	1,013,588.48
Land purchase obligations	170,426.00	56,838.00
Land rentals paid in advance	14,272.16	17,116.11
Reserve for unsettled claim		75,000.00
	$1,902,042.63	$1,433,823.92
Difference representing working capital	$1,289,053.85	$ 902,573.36
Decrease therein		$ 386,480.49

COMPARISON OF NET ASSETS OF BOND INTEREST AND SINKING FUNDS

	June 30, 1935	June 30, 1936
Assets:		
Cash	$3,562,759.69	$3,589,485.95
Liabilities:		
Matured bonds not presented	$ 33,000.00	$ 29,000.00
Accrued interest on bonds	819,743.49	871,649.27
	$ 852,743.49	$ 900,649.27
Net assets	$2,710,016.20	$2,688,836.68
Decrease therein		$ 21,179.52

CITY OF LOS ANGELES

MUNICIPAL WATER WORKS IMPROVEMENT DISTRICTS

STATEMENT OF ASSETS AND LIABILITIES—JUNE 30, 1936

District Number	ASSETS				LIABILITIES						
					Accrued Interest				Bonds Outstanding		
	Unapplied construction Funds	Sinking and interest funds	Amount to be collected in taxes levied and to be levied	Total assets	Past due and unpaid	Not due	Advances repayable to the City	Payable to water revenue fund	Matured and unpaid	Unmatured	Total liabilities
Los Angeles County No. 3		$137,024.10	$982,278.08	$1,119,302.18		$27,302.18				$1,092,000.00	$1,119,302.18
Municipal Improvement Districts:											
1		61,933.05	(c) (10,720.64)	51,212.41		212.41				51,000.00	51,212.41
2		16,991.34	126,604.26	143,595.60		595.60				143,000.00	143,595.60
3		7,453.90	20,662.73	28,116.63		116.63				28,000.00	28,116.63
9		7,284.64	95,375.17	102,659.81	$ 192.50	467.31				102,000.00	102,659.81
11		31,955.80	350,703.54	382,659.34	997.50	1,661.84				380,000.00	382,659.34
18		5,105.66	59,297.56	64,403.22	110.00	293.22				64,000.00	64,403.22
19		12,494.58	179,490.49	191,985.07	110.00	875.07				191,000.00	191,985.07
23		4,783.05	162,766.42	167,549.47	27.50	1,521.97				166,000.00	167,549.47
27		36,454.63	516,286.62	552,741.25	247.50	7,493.75				545,000.00	552,741.25
35	$ 28,467.12	11.19	263,968.69	292,447.00	(a) 35,282.50	(a) 5,445.00	$3,252.38	$28,467.12	(a) $22,000.00	(a) 198,000.00	292,447.00
36	195,096.22	25,124.49	769,946.09	990,166.80	7,041.25	19,969.31		26,156.24		937,000.00	990,166.80
52	25,119.60	3,252.74	135,033.92	163,406.26		2,300.00		1,106.26		160,000.00	163,406.26
53		6,453.90	103,166.10	109,620.00		1,620.00				108,000.00	109,620.00
54		487.96	78,022.04	78,510.00	(a) 1,710.00	(a) 1,800.00			(a) 3,000.00	(a) 72,000.00	78,510.00
58		9,580.81	21,634.19	31,215.00	60.00	155.00				31,000.00	31,215.00
(b) 61		77.68	9,262.54	9,340.22	3.04	138.06				9,199.12	9,340.22
(b) 62		180.60	4,745.03	4,925.63	1.67	72.76				4,851.20	4,925.63
(b) 63		.09	9,566.43	9,566.52	(a) 384.94	(a) 116.88			(a) 1,272.70	(a) 7,792.00	9,566.52
(b) 67		738.34	11,795.38	12,533.72	22.64	184.92				12,326.16	12,533.72
69		11,436.34	57,293.66	68,730.00	450.00	1,280.00			3,000.00	64,000.00	68,730.00
75	6,991.25	4,453.66	161,401.35	172,846.26	431.25	2,415.01			2,000.00	168,000.00	172,846.26
	$255,674.19	$383,278.55	$4,108,579.65	$4,747,532.39	$47,072.29	$76,036.92	$3,252.38	$55,729.62	$31,272.70	$4,534,168.48	$4,747,532.39

(a) Interest and principal of bonds in default.

(b) The figures in respect of districts Nos. 61, 62, 63 and 67 relate to that portion of the district bond funds that was expended for water works purposes.

(c) Represents excess of sinking and interest fund over total bonds outstanding and accrued interest at June 30, 1936, resulting from reassessment of delinquent taxes that have now been collected.

EXHIBIT VI

CITY OF LOS ANGELES
STATEMENT OF MUNICIPAL WATER WORKS IMPROVEMENT DISTRICT BONDS
JUNE 30, 1936

Improvement District:	Authorized	Date of Issue	Interest Rate %	Sold	Matured	Outstanding	Annual Maturities Amount	Annual Maturities Period
Los Angeles County Water Works District No. 3	$2,604,000.00	February 1, 1916	6	$2,604,000.00	$1,512,000.00	$1,092,000.00	$84,000.00	1937—1949
Municipal Improvement District:								
No. 1	1,020,000.00	December 1, 1916	5	1,020,000.00	969,000.00	51,000.00	51,000.00	1936
No. 2	390,000.00	December 1, 1916	5	390,000.00	247,000.00	143,000.00	13,000.00	1936—1946
No. 3	200,000.00	December 1, 1916	5	116,000.00	88,000.00	28,000.00	4,000.00	1936—1942
No. 9	150,000.00	December 1, 1923	5½	150,000.00	48,000.00	102,000.00	4,000.00	1936—1959
							6,000.00	1960
No. 11	700,000.00	December 1, 1919	5¼	700,000.00	320,000.00	380,000.00	20,000.00	1936—1954
No. 18	100,000.00	December 1, 1923	5½	100,000.00	36,000.00	64,000.00	3,000.00	1936—1955
							4,000.00	1956
No. 19	275,000.00	December 1, 1923	5½	275,000.00	84,000.00	191,000.00	7,000.00	1936—1961
							9,000.00	1962
No. 23	250,000.00	May 1, 1924	5½	250,000.00	84,000.00	166,000.00	7,000.00	1937—1954
							8,000.00	1955—1959
No. 27	776,000.00	October 1, 1924	5½	776,000.00	231,000.00	545,000.00	21,000.00	1936—1940
							20,000.00	1941—1962
No. 35	275,000.00	January 1, 1925	5½	275,000.00	77,000.00	198,000.00	7,000.00	1937—1963
							9,000.00	1964
No. 36	1,300,000.00	February 1, 1925	5¼	792,000.00	363,000.00	429,000.00	33,000.00	1937—1949
		February 1, 1925	5	508,000.00	----------	508,000.00	33,000.00	1950—1951
							34,000.00	1952—1964
No. 52	200,000.00	April 1, 1928	5¾	200,000.00	40,000.00	160,000.00	5,000.00	1937—1968
No. 53	195,000.00	April 1, 1928	6	195,000.00	87,000.00	108,000.00	Various	1937—1967
No. 54	115,000.00	August 1, 1928	6	115,000.00	43,000.00	72,000.00	Various	1936—1963
No. 58	140,000.00	December 1, 1928	6	140,000.00	109,000.00	31,000.00	None	1936
							Various	1939—1963
No. 69	82,000.00	September 1, 1929	6	82,000.00	18,000.00	64,000.00	3,000.00	1936—1955
							4,000.00	1956
No. 75	198,277.00	April 1, 1930	5¾	198,000.00	30,000.00	168,000.00	5,000.00	1937—1966
							6,000.00	1967—1969
No. 76	65,000.00							
Water Works Portion of Improvement Districts Nos. 61, 62, 63 and 67 bonds issued in part for Water purposes	44,734.80			44,734.80	10,566.32	34,168.48		
	$9,080,011.80			$8,930,734.80	$4,396,566.32	$4,534,168.48		
Matured bonds not presented for payment at June 30, 1936:								
Municipal Improvement District								
No. 35					$ 22,000.00			
No. 54					3,000.00			
No. 63					1,272.70			
No. 69					3,000.00			
No. 75					2,000.00	31,272.70		
Total bonds outstanding June 30, 1936						$4,565,441.18		

BUREAU OF POWER AND LIGHT

RESOURCES AVAILABLE AND DISPOSITION THEREOF

A summary of the resources available and the disposition thereof, as disclosed by a comparison of the balance sheets at the beginning and end of the year, is given in Exhibit IV. In condensed form the summary may be stated thus:

Resources available:

Funds derived from operations	$ 6,550,000
Funds derived from sale of bonds	33,576,000
Miscellaneous sources	443,000
	$ 40,569,000

Disposition thereof:

Expended in plant	$ 12,775,000
Redemption of bonds and notes	24,131,000
Payment to Reserve Fund of City	1,250,000
Increase in working capital	1,992,000
Miscellaneous items	421,000
	$ 40,569,000

All items are explained in detail in the text following.

INCOME ACCOUNT

The details of the income and expenses for the year are shown in Exhibit II.

Operating Revenues:

The following table sets forth a comparison of the operating revenues for the two years ending June 30, 1936.

	Year Ending		Increase
	June 30, 1935	June 30, 1936	(Decrease)
General consumers—lighting	$ 8,583,892.73	$ 9,203,868.53	$619,975.80
General consumers—power	3,480,664.15	3,685,079.74	204,415.59
General consumers—combination light and power	627,092.61	411,231.52	(215,861.09)
Governmental consumers—lighting	1,785,729.34	1,767,950.75	(17,778.59)
Governmental consumers—power	276,980.95	267,636.26	(9,344.69)
Governmental consumers—combination light and power	139,752.17	96,043.51	(43,708.66)
Miscellaneous electric revenues	72,424.50	80,732.95	8,308.45
Other operating revenues	57,464.90	38,929.78	(18,535.12)
	$15,024,001.35	$15,551,473.04	$527,471.69

Although approximately 9% more kilowatt-hours were sold and used in operations during the year ending June 30, 1936, than during the previous year, a corresponding increase in revenues did not follow, due to a general reduction in rates effective February 1, 1936. The ordinance effecting this reduction in rates discontinued rates for combination light and power. This change in classification resulted in decreases in "combination" revenues, compared to the previous year, with approximately corresponding increases in classifications "light" and "power."

Nonoperating Revenues:

During the year earnings from other than electric operations were as follows:

Interest received and accrued:		
On balances in special bond interest and sinking fund	$21,397.99	
On receivables from the Metropolitan Water District of Southern California	3,820.57	
On miscellaneous receivables	626.08	$25,844.64
Rents from nonoperating properties (mostly on transmission loop line right-of-way)	$46,969.51	
Less: Expenses incident to rental properties	34,775.07	12,194.44
As per Exhibit II		$38,039.08

Operating Expenses:

The following is a comparison of the operating expenses, by classes, for the two years ending June 30, 1936:

	Year Ending June 30, 1935	Year Ending June 30, 1936	Increase (Decrease)
Production	$ 200,028.33	$ 221,649.77	$ 21,621.44
Power purchased	2,814,334.80	2,895,037.07	80,702.27
Transmission	148,591.70	176,360.59	27,768.89
Distribution	1,662,708.14	1,708,092.81	45,384.67
Utilization	482,391.60	519,987.55	37,595.95
Commercial	721,658.07	693,933.25	(27,724.82)
New Business	424,901.96	502,775.80	77,873.84
General	878,068.92	854,771.31	(23,297.61)
	$7,332,683.52	$7,572,608.15	$239,924.63

Interest Paid and Accrued on Long-term Debt:

Interest paid and accrued:			
On general bonds		$1,453,363.75	
On revenue bonds		476,271.11	
On Reconstruction Finance Corporation notes	$342,799.14		
Less: Refund account reduction in interest rate previous to April 1, 1934, from 5% to 4%	27,213.70	315,585.44	
On long-term payable to Bureau of Water Works and Supply		83,448.34	$2,328,668.64
Less: Net interest charges benefiting Boulder Canyon transmission construction, capitalized		$ 791,856.55	
Premiums on general bonds amortized		10,855.75	802,712.30
As per Exhibit II			$1,525,956.34

Provision for Depreciation of Plant and Equipment:

Details in connection with provision of $2,270,573.00 are given under balance sheet caption "Plant and Equipment" hereafter.

STATEMENT OF EARNINGS, ETC., FROM COMMENCEMENT OF OPERATIONS

A condensed statement showing the result of operations by fiscal years is attached as Exhibit V and seems to require no comment.

BALANCE SHEET
PLANT AND EQUIPMENT ACCOUNTS

General Statement:

The net additions to the property accounts during the year amounted to $12,224,708.55, as summarized below:

Property Accounts:	Balances June 30, 1935	Net Additions (Reductions)	Balances June 30, 1936
Production (power plants, etc.)	$14,539,586.15	$ 46,175.85	$ 14,585,762.00
Transmission system	10,696,314.35	429,830.93	11,126,145.28
Distribution system	49,416,021.70	1,379,705.53	50,795,727.23
Utilization equipment	1,471,451.07	(21,733.01)	1,449,718.06
General structures, etc.	3,977,857.15	224,409.80	4,202,266.95
Uncompleted construction	15,820,360.44	10,218,195.41	26,038,555.85
	$95,921,590.86	$12,276,584.51	$108,198,175.37
Deduct: Donations in aid of construction	1,379,874.90	51,875.96	1,431,750.86
	$94,541,715.96	$12,224,708.55	$106,766,424.51

Lands:

In the summary above, lands and rights-of-way are included in the property account benefiting through their use. The investment in these lands and rights-of-way as at June 30, 1935, the net additions and reductions, and the resultant balances at June 30, 1936, were as follows:

	Balances June 30, 1935	Net Additions (Reductions)	Balances June 30, 1936
Production (power plants, etc.)	$ 733,399.11	$ (9,652.70)	$ 723,746.41
Transmission	6,034,516.11	309,787.74	6,344,303.85
Distribution	780,359.63	(85.96)	780,273.67
General	1,093,556.11	(18,071.63)	1,075,484.48
	$8,641,830.96	$281,977.45	$8,923,808.41

The net changes in land accounts during the year are accounted for as follows:

	Additions	Reductions	Reclassification	Net Change
Production lands	$ 1,915.50	$11,568.20	$	$ (9,652.70)
Transmission lands	309,787.74			309,787.74
Distribution lands	4,784.71		(4,870.67)	(85.96)
General lands	5,157.70	28,100.00	4,870.67	(18,071.63)
	$321,645.65	$39,668.20	$	$281,977.45

The principal addition was the cost of right-of-way for the Boulder Canyon Transmission Project. The reductions represented the value of structures purchased with land in Bouquet Canyon, transferred to appropriate structure account, and the value of submerged land at Boulder Canyon, transferred to the United States Government. The reclassification was for land at Wilmington acquired from the Southern California Edison Co., for distribution station use, transferred to general lands when no longer used or useful for distribution purposes.

Production (Power Plants, etc.)

During the year the "Y" branch connection between the Bouquet Canyon pipe line and Fairmont penstock was completed. As in the case of the reservoir and pipe line, this installation is equally beneficial to each of the Bureaus of the Department. The costs, included in production facilities in Power Bureau accounts, were $126,127.24, of which $67,263.05 was allocated to the Water Bureau. The computation used for the allocation is given under caption "Source of Water Supply System" in the report for the Water Bureau, heretofore.

Transmission system:

As above stated, the principal addition to the transmission system was rights-of-way for the Boulder Canyon Transmission Project. Major betterments in station equipment at Power Plant No. 1 and at St. John Receiving Station resulted in further increase in transmission investment.

Distribution system:

The net additions to the distribution system were as follows:

Station equipment	$ 92,075.66
Poles and fixtures	163,443.52
Overhead conductors	104,066.22
Underground conduits	323,773.88
Underground conductors	324,147.08
Line transformers	110,495.08
Services	156,701.88
Consumers' meters	103,107.28
Miscellaneous	1,894.93
	$1,379,705.53

The net additions to distribution station equipment resulted chiefly from installations in Century and Wilmington Receiving Stations, in connection with Boulder Canyon power. During the year underground conduit with high voltage conductors was installed between Normandie and Trinity Distribution Stations. Numerous underground lines, for both high and low voltage, were laid in various sections of the city. Other increases in investment reflect normal growth of the system.

Utilization Equipment:

During the last few years, many ornamental lighting systems, principally installed in new subdivisions, have become inactive. The transformers serving the greater number of these inactive systems were removed during the year under review, resulting in a net reduction in utilization investment of $21,733.01.

General Structures, etc.:

The increase in general investment was mainly in connection with Joint Facility activities, as follows:

Office furniture	$ 3,588.09
Structures (100-ton crane, etc.)	85,413.19
Shops equipment	13,506.69
Stores equipment	2,739.74
Transportation equipment	30,056.23
Construction equipment	16,477.22
	$151,781.16

General investment was also increased $48,232.16 by additions of equipment in the General Laboratory, including the installation of a 1,000 KVA, 350,000 volt transformer for testing purposes; and $19,656.00 in communication equipment for general use.

Uncompleted Construction:

Uncompleted construction at June 30, 1935, and at June 30, 1936, and the changes therein are summarized as follows:

	June 30, 1935	June 30, 1936	Increase (Decrease)
Boulder Canyon transmission line project	$13,061,860.16	$20,926,470.98	$ 7,864,610.82
Buildings and improvements at Boulder City	.....	82,742.33	82,742.33
Transmision line between Receiving Stations "A" and "B"	919,428.17	1,006,667.36	87,239.19
Fraquency change—50 to 60 cycles, and voltage standardization	.....	1,700,903.12	1,700,903.12
Owens Valley power development	1,350,086.34	1,351,236.72	1,150.38
Construction steam plant at Wilmington (suspended)	282,280.78	269,493.94	(12,786.84)
Connecting Bouquet Canyon reservoir pipe line to Fairmont penstock	120,203.37	.....	(120,203.37)
Distribution stations	.....	458,229.51	458,229.51
Distribution system purchased	.....	160,918.52	160,918.52
Miscellaneous	86,501.62	81,893.37	(4,608.25)
	$15,820,360.44	$26,038,555.85	$10,218,195.41

The total expenditures to June 30, 1936 on the Boulder Canyon transmission line project, were as follows:

	Power Revenue Fund	Bond Election 1926 Fund	Power Transmission Construction Reserve Fund	Total
Uncompleted construction:				
Transmission line and switching stations	$ 60,083.42	$.....	$14,386,500.68	$14,446,584.10
Receiving station facilities	22,812.31	.....	1,846,874.40	1,869,686.71
Tie line terminal facilities	227,256.05	41,001.80	1,804,905.91	2,073,163.76
Step-down station	.....	.....	1,100,816.25	1,100,816.25
Other	86,122.75	.....	81,043.13	167,165.88
	$ 396,274.53	$41,001.80	$19,220,140.37	$19,657,416.70
Interest during construction	1,269,054.28	.....	.....	1,269,054.28
As above	$1,665,328.81	$41,001.80	$19,220,140.37	$20,926,470.98
Land and rights-of-way	.....	.....	536,618.96	536,618.96
Total	$1,665,328.81	$41,001.80	$19,756,759.33	$21,463,089.94

During the year dormitories and residences, with related improvements, were purchased to house the Bureau's employees at Boulder City. Structures were purchased in place from among those used in the construction of the Dam. The initial cost, together with rehabilitation expenses, are carried in uncompleted construction until capitalization can be made upon the completion of the Boulder Canyon Project.

Miscellaneous additions to the transmission line connecting Century and St. John Receiving Stations were made during the year.

To June 30, 1935, $108,128.53 had been expended in preliminary work looking toward the change in frequency of the electric system from 50 to 60 cycles, the amount being included in my report as preliminary engineering under "Deferred Debits." During the year under review actual work on the change was started. It being feasible and opportune to undertake other work at the same time toward improving the system and service to consumers, the Bureau concurrently carried on work of overhauling its system by making certain replacements in its generating plants and elsewhere and in establishing the standard distribution voltage of 120/240 volts. The year's expenditure in these various activities was $1,592,774.59. The amount shown in uncompleted construction, $1,700,903.12, is the total expenditures at the date of the balance sheet.

The connection between the pipe line serving Bouquet Canyon reservoir and the penstock above Power Plant No. 1 was completed during the year, and charged to plant accounts.

Three stations to augment distribution facilities were initiated but not completed during the year. There was expended to June 30, 1936, in their construction:

Distribution Station No. 29, Pacific Palisades	$162,773.66
Distribution Station No. 30, Eagle Rock	249,931.04
Distribution Station No. 43, Mines Field	45,524.81
	$458,229.51

The distribution system purchased was acquired from the Seventh Street Company for $160,000.00, which, with related costs, is shown in the uncompleted construction account until rehabilitated.

Increase and decreases in other items are of a minor character and seem to require no comment.

Donations in Aid of Construction:

There was added during the year $51,875.96 to Donations in Aid of Construction. This addition was principally occasioned by the absorption of uncleared extension deposits after the ten-year period for reimbursement had expired.

Reserve for Depreciation:

Provision for depreciation of plant and equipment has been made on the same basis as in previous years. The changes in the reserve during the year are summarized as follows:

Balance June 30, 1935		$13,475,491.01
Add: Provision for the year ending June 30, 1936:		
Charged to profit and loss (Exhibit II)	$2,270,573.00	
Charged to clearing accounts	69,970.00	2,340,543.00
		$15,816,034.01
Deduct: Charges for replacements, etc.:		
Power plants, etc.	$ 25,791.24	
Transmission system	3,998.31	
Distribution system	485,895.35	
Utilization equipment	13,372.59	
General structures, etc.	21,114.22	550,171.71
Balance June 30, 1936 (Exhibit I)		$15,265,862.30

The provision charged to profit and loss is in respect of assets depreciated on the 5% sinking fund method, the charge being made up of:

Annuity	$1,596,798.00
Interest on reserve balance	673,775.00
As above	$2,270,573.00

The provision charged to clearing accounts is in respect of assets depreciated on the straight-line method.

OTHER ASSET ACCOUNTS

Construction Funds:

Construction funds consist of the cash balances in the following funds:

Electric Plant Bond Election 1926 Fund		$ 785,519.74
Power Transmission Construction Reserve Fund		4,064,344.87
		$4,849,864.61
Deduct: Expenditures recoverable by Revenue Fund	$92,014.05	
Less: Expenditures recoverable by 1926 Fund	284.84	
Expenditures recoverable by P. T. C. R. Fund	20,196.07	
	$20,480.91	71,533.14
Available construction funds (Exhibit I)		$4,778,331.47

Electric plant bonds, 1926 election, remain unsold in the amount of $3,000,000.

Metropolitan Water District of Southern California—Long-term Receivable:

At June 30, 1935, the obligation of the Metropolitan Water District of Southern California to the Bureau for services rendered in connection with the Colorado River Aqueduct was $118,707.89, which, with interest accrued during the year, $3,820.57, brought the liability to $122,528.46 at June 30, 1936.

Bond Interest and Sinking Funds:

The changes during the year in the electric plant bond interest and sinking funds are summarized as follows:

Balance June 30, 1935		$3,057,236.10
Add:		
Transfer from Power Revenue Fund in respect of interest and sinking fund requirements for the year	$3,284,973.71	
Interest earned on cash balances in special bond interest and redemption fund	21,397.99	3,306,371.70
		$6,363,607.80
Deduct:		
Bonds redeemed	$1,326,000.00	
Interest coupons paid	1,929,959.61	3,255,959.61
Balance June 30, 1936 (Exhibit I)		$3,107,648.19

The balance in bank, $24,047.01, was for payment of revenue bond coupons matured at the date of the balance sheet.

Deposit to Secure an Indemnity Bond:

By court order an indemnity bond protecting property owners in Huntington Park and Southgate in connection with the extension of the transmission loop line through those municipalities was negotiated during the year. A deposit of $225,000.00 was made to secure the bond.

Revenue Fund:

Cash on hand and deposited with the City Treasurer at June 30, 1936, amounted to $6,570,041.82. Cash deposited, $6,480,199.04, was reconciled with the City Treasurer's balance.

Power Construction Funds—Current Account:

This account represents the net amount available at June 30, 1936, in construction funds (as above) for reimbursement to the revenue fund for expenditures made by the revenue fund in behalf of such construction funds, and is transferred from "Construction Funds" to "Power Construction Funds—Current Account" for balance sheet purposes only.

Miscellaneous Accounts and Notes Receivable:

As shown by the balance sheet, the principal item is that of consumers' accounts receivable. Other accounts receivable amount to $97,311.09, and notes receivable, $15,691.25. Notes receivable consist chiefly of obligations from land subdividers for line extensions. A reserve for possible loss on accounts and notes has been provided in the sum of $15,605.78.

Miscellaneous Deposits and Revolving Funds:

Revolving funds in the hands of Divisions and employees amounted to $14,600.00, and special deposits for various purposes, $5,774.50.

Bureau of Water Works and Supply—Current Account:

The balance in this account, $271,281.33, represents the net amount due from the Bureau of Water Works and Supply, principally for June, 1936, expenses of joint facility divisions of the Department, which, in the main, are paid in the first instance by the Bureau of Power and Light, subject to reimbursement for expenses applicable to the Bureau of Water Works and Supply.

Construction Materials and Supplies:

Physical inventories of materials and supplies on hand were taken at scheduled times throughout the year, and accounts adjusted accordingly. The amount stated in the balance sheet, $1,542,431.45, is the book value of all materials and supplies in working stores of the Power Revenue Fund at June 30, 1936.

Deferred Charges:

Preliminary survey and investigation charges and other deferred debits showed an increase during the year of $129,917.09, accounted for as follows:

Increases:	
Land and right-of-way acquisition deposits with County Clerk per court order	$131,007.05
Proposed acquisition of certain Southern California Edison Company properties	18,238.58
Proposed acquisition of the electric system of the Los Angeles Gas and Electric Corp.	14,496.45
Preliminary work—potential power projects	14,659.95
Deferred facility charges	56,217.82
Prepayments	1,968.15
Miscellaneous	1,457.62
	$238,045.62
Deductions:	
Preliminary expenditures—frequency change (included in "Uncompleted Construction" above)	108,128.53
Increase during fiscal year, as above	$129,917.09

OTHER LIABILITY ACCOUNTS

Funded Debt:

Particulars of the several issues of bonds for power purposes are shown in Exhibit III.

General Bonds:

The changes during the year are summarized as follows:

Outstanding June 30, 1935:		
Unmatured	$32,535,000.00	
Matured	4,000.00	$32,539,000.00
Redeemed during year		1,326,000.00
Outstanding June 30, 1936:		
Unmatured	$31,203,000.00	
Matured	10,000.00	$31,213,000.00

As hereinbefore mentioned $3,000,000.00 of the 1926 bonds remain unsold.

Revenue Bonds:

As set forth in my report for last year, to June 30, 1935, $12,250,000.00 had been borrowed from the Reconstruction Finance Corporation on long-term notes. During September, 1935, additional notes totaling $10,549,000.00 were sold to the Corporation, bringing the Bureau's debt to the Corporation to $22,799,000.00.

On December 22, 1935, $22,799,000 of "Revenue Bonds," an obligation of the Power Revenue Fund, were sold at a premium of 1%, $227,990. The proceeds from this sale were used to retire the notes held by the Reconstruction Finance Corporation.

The revenue bonds were outstanding June 30, 1936.

Bureau of Water Works and Supply—Long-term Payable:

The changes in this liability during the year were as follows:

Payable at June 30, 1935		$1,892,520.81
Less: Liquidations:		
In cash	$78,855.02	
By allocation of construction expenditures	67,263.05	146,118.07
Payable at June 30, 1936		$1,746,402.74

Particulars of the construction expenditures allocated are given under "Plant and Equipment" above.

Accrued Interest:

Particulars in connection with interest on long-term debt payable and accrued are set forth in detail in the balance sheet (Exhibit I).

Other Current Liabilities:

All accounts payable of the Power System are reflected in the accompanying balance sheet under this caption, except that no provision is made therein for any liabilities of a contingent nature, including materials contracted for but not received at June 30, 1936, in the approximate amount of $1,680,000.00. Accrued payrolls of $474,160.63 were for the fifteen days ending June 30, 1936, and the amount due Southern California Edison Company, Ltd., of $214,805.73, represents the June bill for electric energy purchased. Extension deposits, etc., of $180,765.44 were reduced during the year by $55,883.49. This reduction was occasioned principally by the transfer of extension deposits to "Donations in Aid of Construction" after the ten-year period for reimbursement had expired.

Unamortized Premium on Debt:

The changes in this account are summarized as follows:

Unamortized June 30, 1935 (General bonds)		$143,517.99
Add:		
Premiums received (Revenue bonds)	$227,990.00	
Less: Expense of sale	42,488.81	185,501.19
		$329,019.18
Deduct:		
Amortized during year:		
General bonds	$ 10,855.75	
Revenue bonds	3,689.50	14,545.25
Unamortized June 30, 1936		$314,473.93

Deferred Credit:

A deposit of $300,000 by the City of Pasadena was received during the year under review. This amount is to be applied on rental charges to that city by the Bureau for transmission facilities as provided in the agreements relating to the Boulder Canyon project.

Surplus:

Surplus account was increased during the year from operations in the amount of $4,220,374.63, and there was charged against it a payment of $1,250,000.00 from the Power Revenue Fund to the Reserve Fund of the City, made in accordance with the provisions of Section 382 of the City Charter. The total earned surplus to June 30, 1936, was $52,237,335.45; the total payments into the Reserve Fund of the City, $1,558,000.00; the balance in the account at June 30, 1936, was $50,679,335.45.

Respectfully submitted,
L. M. ANDERSON,
Controller.

EXHIBIT I

DEPARTMENT OF WATER AND POWER
CITY OF LOS ANGELES
BUREAU OF POWER AND LIGHT
BALANCE SHEET—JUNE 30, 1936

ASSETS

PLANT AND EQUIPMENT:		
Power plants and waterways	$ 14,585,762.00	
Transmission system	11,126,145.28	
Distribution system	50,795,727.23	
Utilization equipment	1,449,718.06	
General structures and equipment	4,202,266.95	
Uncompleted construction	26,038,555.85	
	$108,198,175.37	
Less: Donations in aid of construction	1,431,750.86	$106,766,424.51
CONSTRUCTION FUNDS:		
Cash with City Treasurer	$ 4,849,864.61	
Less: Net amount available for reimbursement to Revenue Fund for construction expenditures (see below)	71,533.14	4,778,331.47
METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA—LONG-TERM RECEIVABLE		122,528.46
BOND INTEREST AND SINKING FUNDS:		
Cash with City Treasurer for payment of:		
Matured bonds and coupons	$ 19,136.25	
Future maturities	3,088,511.94	
	$ 3,107,648.19	
Deposit in bank for payment of revenue bond coupons	24,047.01	3,131,695.20
DEPOSIT TO SECURE AN INDEMNITY BOND		225,000.00
REVENUE FUND:		
Cash with City Treasurer	$ 6,480,199.04	
Cash on hand	89,842.78	6,570,041.82
POWER CONSTRUCTION FUNDS — Current Account (see above)		71,533.14
MISCELLANEOUS ACCOUNTS AND NOTES RECEIVABLE:		
Consumers' accounts	$ 823,665.28	
Other accounts and notes	113,002.34	
	$ 936,667.62	
Less: Reserve for doubtful accounts and notes	15,605.78	921,061.84
MISCELLANEOUS DEPOSITS AND REVOLVING FUNDS		20,374.50
BUREAU OF WATER WORKS AND SUPPLY—Current Account		271,281.33
CONSTRUCTION MATERIALS AND SUPPLIES		1,542,431.45
DEFERRED CHARGES:		
Preliminary engineering	$ 531,934.13	
Miscellaneous	219,454.99	751,389.12
		$125,172,092.84

LIABILITIES

FUNDED DEBT:		
Bonds—general:		
Unmatured	$ 31,203,000.00	
Matured	10,000.00	
	$ 31,213,000.00	
Bonds—revenue:		
Unmatured	22,799,000.00	$ 54,012,000.00
BUREAU OF WATER WORKS AND SUPPLY—LONG-TERM PAYABLE		1,746,402.74
ACCRUED INTEREST:		
Bonds—general:		
Matured coupons	$ 9,136.25	
Accrued but not due	451,206.67	
	$ 460,342.92	
Bonds—revenue:		
Matured coupons	$ 24,047.01	
Accrued but not due	75,996.67	
	$ 100,043.68	560,386.60
OTHER CURRENT LIABILITIES:		
Accounts payable for materials, etc.	$ 1,423,900.02	
Accrued payrolls	474,160.63	
Southern California Edison Company, Ltd.	214,805.73	
Extension deposits, etc.	180,765.44	2,293,631.82
RESERVE FOR DEPRECIATION		15,265,862.30
UNAMORTIZED PREMIUM:		
Bonds—general	$ 132,662.24	
Bonds—revenue	181,811.69	314,473.93
DEFERRED CREDIT:		
Deposit by City of Pasadena		300,000.00
SURPLUS:		
Balance June 30, 1935	$ 47,708,960.82	
Net income, year ending June 30, 1936	4,220,374.63	
	$ 51,929,335.45	
Less: Payments into Reserve Fund of City	1,250,000.00	50,679,335.45
		$125,172,092.84

EXHIBIT II

DEPARTMENT OF WATER AND POWER
CITY OF LOS ANGELES
BUREAU OF POWER AND LIGHT

INCOME ACCOUNT FOR THE YEAR ENDING JUNE 30, 1936

Gross operating revenue:		
General consumers—lighting	$9,203,868.53	
General consumers—power	3,685,079.74	
General consumers—combination light and power	411,231.52	
Governmental consumers—lighting	1,767,950.75	
Governmental consumers—power	267,636.26	
Governmental consumers—combination light and power	96,043.51	
Miscellaneous electric revenues	80,732.95	
Other operating revenues	38,929.78	$15,551,473.04
Deduct: Operating Expenses:		
Production	$ 221,649.77	
Power purchased	2,895,037.07	
Transmission	176,360.59	
Distribution	1,708,092.81	
Utilization	519,987.55	
Commercial	693,933.25	
New business	502,775.80	
General	854,771.31	7,572,608.15
Net operating revenue		$ 7,978,864.89
Add: Nonoperating revenues:		
Interest	$ 25,844.64	
Other nonoperating revenues—net	12,194.44	38,039.08
Net income before interest and depreciation		$ 8,016,903.97
Deduct:		
Interest paid and accrued on funded debt	$2,245,220.30	
Less:		
Interest during construction capitalized	$791,856.55	
Amortization of bond premiums	10,855.75	802,712.30
		$1,442,508.00
Interest on long-term payable to Bureau of Water Works and Supply	83,448.34	
		$1,525,956.34
Provision for depreciation of plant and equipment	2,270,573.00	3,796,529.34
Net income		$ 4,220,374.63

EXHIBIT III

DEPARTMENT OF WATER AND POWER
CITY OF LOS ANGELES
BUREAU OF POWER AND LIGHT
FUNDED DEBT—JUNE 30, 1936

	Authorized	Date of Issue	Interest Rate %	Sold	Matured	Outstanding	Annual Maturities	
							Amount	Period
General Bonds								
1910	$ 3,500,000	June 1, 1911	4½	$ 3,500,000	$ 2,000,000	$ 1,500,000	$100,000	1937—1951
1914	6,500,000	August 1, 1914	4½	6,500,000	4,750,000	1,750,000	250,000	1936—1942
1919	13,500,000	August 1, 1921	5	13,500,000	3,750,000	9,750,000	375,000	1936—1961
1924	16,000,000	October 1, 1924	4½	8,000,000	2,200,000	5,800,000	200,000	1936—1964
		October 1, 1925	4½	4,000,000	1,000,000	3,000,000	100,000	1936—1965
		October 1, 1926	4½	2,000,000	450,000	1,550,000	50,000	1936—1966
		October 1, 1926	4½	500,000	126,000	374,000	14,000	1936—1961
							10,000	1962
		October 1, 1927	4¼	1,500,000	304,000	1,196,000	38,000	1936—1966
							18,000	1967
1926	11,000,000	November 1, 1926	4½	2,000,000	450,000	1,550,000	50,000	1936—1966
		November 1, 1926	4½	1,000,000	252,000	748,000	28,000	1936—1961
							20,000	1962
		November 1, 1926	4	2,500,000	567,000	1,933,000	63,000	1936—1965
							43,000	1966
		July 1, 1928	4½	500,000	98,000	402,000	14,000	1936—1963
							10,000	1964
		July 1, 1928	4½	2,000,000	350,000	1,650,000	50,000	1936—1968
Revenue Bonds 1935	22,799,000	December 2, 1935	4	22,799,000		22,799,000	*	1939—1975
	$73,299,000			$70,299,000	$16,297,000	$54,002,000		
Matured bonds not presented for payment at June 30, 1936:								
1910 general bonds				$ 6,000				
1924 general bonds				4,000		10,000		
Total bonds outstanding June 30, 1936						$54,012,000		

* Maturities of the revenue bonds increase annually from $279,000 in 1939 to $1,140,000 in 1975 so that the total annual amount required for interest and principal payments is approximately the same in each year.

EXHIBIT IV

DEPARTMENT OF WATER AND POWER
CITY OF LOS ANGELES
BUREAU OF POWER AND LIGHT
YEAR ENDING JUNE 30, 1936

SUMMARY OF RESOURCES AVAILABLE AND DISPOSITION THEREOF

Resources Available:	
Net income for the year ending June 30, 1936	$ 4,220,374.63
Add: Provision for depreciation of plant and equipment	2,340,543.00
	$ 6,560,917.63
Deduct: Proportion of bond premium included in income	10,855.75
Funds derived from operations	$ 6,550,061.88
Proceeds from Reconstruction Finance Corporation notes	10,549,000.00
Proceeds from sale of revenue bonds	22,799,000.00
Premium received on revenue bonds	227,990.00
Deposit by City of Pasadena	300,000.00
Decrease in construction funds with City Treasurer	67,901.71
Decrease in net assets of interest and sinking funds (per accompanying table)	75,468.26
Total	$40,569,421.85
Accounted for as follows:	
Additions to plant and equipment (net)	$12,224,708.55
Expenditures for replacements, etc.	550,171.71
Proportion of bond premium capitalized	3,689.50
Bonds matured	1,332,000.00
Payment of notes held by Reconstruction Finance Corporation	22,799,000.00
Expenses—Sale of revenue bonds	42,488.81
Charged to Metropolitan Water District of Southern California	3,820.57
Deposit to secure an indemnity bond	225,000.00
Payment on long-term payable to Bureau of Water Works & Supply	146,118.07
Payments into Reserve Fund of City	1,250,000.00
Increase in working capital (per accompanying table)	1,992,424.64
As above	$40,569,421.85

COMPARISON OF WORKING AND CURRENT ASSETS AND CORRESPONDING LIABILITIES

	June 30, 1935	June 30, 1936
Assets:		
Cash	$4,101,175.90	$ 6,570,041.82
Bureau of Water Works and Supply— Current account	467,242.75	271,281.33
Other accounts receivable	1,026,621.24	941,436.34
Materials and supplies	1,424,595.95	1,542,431.45
Deferred charges	621,472.03	751,389.12
	$7,641,107.87	$10,076,580.06
Liabilities:		
Accrued interest on long-term payable	$ 56,775.62	$
Miscellaneous current liabilities	1,793,808.65	2,293,631.82
	$1,850,584.27	$ 2,293,631.82
Difference representing working capital	$5,790,523.60	$ 7,782,948.24
Increase therein		$ 1,992,424.64

COMPARISON OF NET ASSETS OF BOND INTEREST AND SINKING FUNDS

	June 30, 1935	June 30, 1936
Assets:		
Cash	$ 3,262,429.60	$ 3,131,695.20
Liabilities:		
Matured bonds not presented	$ 4,000.00	$ 10,000.00
Accrued interest on bonds and notes	621,652.74	560,386.60
	$ 625,652.74	$ 570,386.60
Net assets	$2,636,776.86	$ 2,561,308.60
Decrease therein		$ 75,468.26

EXHIBIT V

DEPARTMENT OF WATER AND POWER
CITY OF LOS ANGELES
BUREAU OF POWER AND LIGHT
CONDENSED ANNUAL INCOME STATEMENTS
FROM COMMENCEMENT OF OPERATIONS TO JUNE 30, 1936

Year Ending June 30	Gross Earnings	Maintenance and Operation Expenses	Operating Balance	Depreciation	Interest On Bonds and Other Interest	Other Deductions	Surplus	Payments to Reserve Fund of City From Surplus	Accumulated Surplus
1918* (Approx. 15 Mos.)	$ 3,904,248.80	$ 2,130,312.20	$ 1,773,936.60	$ 447,411.70	$ 1,251,218.42	$ 1,012.73	$ 74,293.75	$	$ 74,293.75
1919*	3,778,084.74	2,074,335.63	1,703,749.11	395,809.39	1,065,266.85	26,169.46	216,503.41	.....	290,797.16
1920*	4,509,698.61	2,578,465.19	1,931,233.42	428,373.70	1,159,062.82	32,494.13	311,302.77	.....	602,099.93
1921*	5,974,450.00	3,010,760.52	2,963,689.48	497,520.34	1,214,954.99	47,983.55	1,203,230.60	.....	1,805,330.53
1922*	6,880,940.74	3,247,861.00	3,633,079.74	457,964.27	1,201,511.97	49,353.61	1,924,249.89	.....	3,729,580.42
1923	7,762,606.97	3,439,055.33	4,323,551.64	622,029.00	1,007,899.30	.....	2,693,623.34	.....	6,423,203.76
1924	9,302,092.29	4,476,738.65	4,825,353.64	732,750.00	1,041,297.19	.....	3,051,306.45	.....	9,474,510.21
1925	9,836,402.33	5,136,984.70	4,699,417.63	1,035,709.00	927,740.87**	.....	2,735,967.76	.....	12,210,477.97
1926	11,237,158.89	5,836,131.18	5,401,027.71	1,186,106.00	1,418,468.85	.....	2,796,452.86	.....	15,006,930.83
1927	12,658,994.82	6,504,885.91	6,154,108.91	1,321,181.00	1,574,439.48	.....	3,258,488.43	.....	18,265,419.26
1928	13,558,049.44	7,023,274.13	6,534,775.31	1,442,026.00	1,756,213.73	1,204,677.32#	2,131,858.26	.....	20,397,277.52
1929	14,737,762.58	7,528,079.23	7,209,683.35	1,567,832.00	1,761,480.64	253,398.48	3,626,972.23	.....	24,024,249.75
1930	15,295,009.41	7,761,377.64	7,533,631.77	1,651,557.00	1,657,575.95	.....	4,224,498.82	.....	28,248,748.57
1931	15,368,416.21	7,656,026.01	7,712,390.20	1,785,210.00	1,582,890.41	.....	4,344,289.79	.....	32,593,038.36
1932	15,409,160.79	7,634,670.82	7,774,489.97	1,877,541.00	1,637,867.70	359,009.69	3,900,071.58	.....	36,493,109.94
1933	14,308,769.62	6,836,278.43	7,472,491.19	2,010,580.00	1,567,754.96	82,898.05	3,811,258.18	.....	40,304,368.12
1934	14,332,940.97	7,065,566.64	7,267,374.33	2,086,899.00	1,528,385.15	.....	3,652,090.18	165,000.00	43,791,458.30
1935	15,062,531.38	7,332,683.52	7,729,847.86	2,169,260.00	1,560,227.00	60,141.66+	4,060,502.52	143,000.00	47,708,960.82
1936	15,589,512.12	7,572,608.15	8,016,903.97	2,270,573.00	1,525,956.34	.....	4,220,374.63	1,250,000.00	50,679,335.45
Total.....	$209,506,830.71	$104,846,094.88	$104,660,735.83	$23,986,332.40	$26,440,212.62	$1,996,855.36	$52,237,335.45	$1,558,000.00	$50,679,335.45

* After giving effect to revenues and expenses of distributing system operated by Southern California Edison Company under terms of an operating agreement subsequent to purchase of the system by the City on May 16, 1922, and also after giving effect to interest paid Company under such agreement.

** Interest charged for the year was $1,108,823.12 from which has been deducted, for purposes of this statement, sinking fund earnings prior to June 30, 1924, of $181,082.25.

Includes losses and expenses of $929,870.65 arising from St. Francis Dam disaster, which were charged to Surplus Account, "Other Deductions" for the year ending June 30, 1929, includes similar expenses in the amount of $128,122.93.

+ Credit.

WHT.B.0248